ISSN (print) 0093-4666 © 2012. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/121.93

Volume 121, pp. 93–132 *July–September 2012*

Ganoderma in Brazil: known species and new records

Mabel Gisela Torres-Torres[1,2], Laura Guzmán-Dávalos[2,*] & Adriana de Mello Gugliotta[3]

[1]*Universidad Tecnológica del Chocó, Ciudadela Medrano, Quibdó, Chocó, Colombia,*
[2]*Departamento de Botánica y Zoología, Universidad de Guadalajara, Apdo. postal 1-139, Zapopan, Jal., 45101, Mexico*
[3]*Seção de Micologia e Liquenologia, Instituto de Botânica, Caixa Postal 3005, CEP 01061-970, São Paulo, SP, Brazil*
*Correspondence to: *lguzman.cucba@gmail.com*

Abstract — Eighteen species of *Ganoderma* (*Basidiomycota, Polyporales, Ganodermataceae*) are recorded from Brazil based on specimens deposited at EMBRAPA and SP. Twenty type specimens from Brazil, Belize, Colombia, Cuba, Ecuador, Finland, France, Grenada, Guinea, Mexico, Nicaragua, Panama, USA, and Venezuela were studied in order to establish the proper identity of specimens. Three species (*G. mexicanum*, *G. perzonatum*, *G. pulverulentum*) are new reports for Brazil, *G. weberianum* is recorded for the first time for America, and *G. mexicanum*, *G. perturbatum,* and *G. perzonatum*, are recorded for the first time since their original description. All species with laccate pileus (except *G. vivianimercedianum*) and the non-laccate *G. amazonense* and *G. brownii* are described in detail and illustrated.

Key words — basidiospores, pileipellis cells, taxonomy

Introduction

Ganoderma P. Karst. is a genus with a cosmopolitan distribution, with many tropical species and some restricted to temperate regions. According to Ryvarden (2004) the genus is represented in the neotropics by 20 species, a large number of which are known only from their type locality. Although many *Ganoderma* species have been recorded from Brazil, a tropical country with a great mycological diversity, some have been incorrectly determined and the occurrence of others has not been confirmed. Except for papers by Torrend (1920), Loguercio-Leite et al. (2005) and Gomes-Silva et al. (2011), there have been no detailed studies of *Ganoderma* in Brazil, and taxa not described by them are only recorded in lists, so they have been neither described nor illustrated.

Previous records from Brazil have been listed under the following names: *G. amazonense*, *G. annulare*, *G. applanatum*, *G. australe*, *G. bibadiostriatum*,

G. brownii, *G. citriporum*, *G. chalceum*, *G. colossus*, *G. concinnum*, *G. curtisii*, *G. dorsale*, *G. elegantum*, *G. lobatoideum*, *G. lobatum*, *G. lucidum*, *G. multicornum*, *G. multiplicatum*, *G. multiplicatum* var. *vitalii*, *G. neurosporum*, *G. nitens*, *G. nitidum*, *G. oerstedii*, *G. opacum*, *G. orbiforme*, *G. parvulum*, *G. perturbatum*, *G. pygmoideum*, "*G. reniformis*" [*Elfvingia reniformis*], *G. resinaceum*, *G. sessile*, *G. sessiliforme*, *G. stipitatum*, *G. subamboinense*, *G. subfornicatum*, *G. testaceum*, *G. tornatum*, *G. tropicum*, *G. vivianimercedianum*, and *G. zonatum* (Baltazar & Gibertoni 2009; Bononi et al. 1981, 2008; Da Silva & Minter 1995; de Jesus 1993, 1996; de Meijer 2001, 2006; Drechsler-Santos et al. 2008, 2009; Fidalgo 1968; Furtado 1967; Gerber 1996; Gerber & Loguercio-Leite 1997; Gibertoni & Cavalcanti 2003; Gibertoni & Drechsler-Santos 2010; Góes-Neto 1999; Góes-Neto et al. 2003; Gomes-Silva & Gibertoni 2009; Gomes-Silva et al. 2011; Gottlieb et al. 1998; Gottlieb & Wright 1999a,b; Groposo & Loguercio-Leite 2005; Loguercio-Leite & Wright 1991; Loguercio-Leite et al. 2005; Moncalvo & Buchanan 2008; Patouillard 1889; Rajchenberg & de Meijer 1990; Rick 1960; Ryvarden 2004; Ryvarden & de Meijer 2002; Sotão et al. 1991, 2002; Steyaert 1962, 1980; Torrend 1920; Torres-Torres et al. 2008; Westphalen et al. 2010). Of these, the most commonly reported species are *G. applanatum* and *G. lucidum* sensu lato. As a continuation of the work by Torres-Torres & Guzmán-Dávalos (2005, 2007, 2008) and by Torres-Torres et al. (2008), the goal of the present study is to contribute to the knowledge of *Ganoderma* through reviewing species occurring in Brazil by examining the specimens deposited at SP and EMBRABA herbaria.

Materials & methods

Specimens studied

Materials studied were from EMBRAPA (personal collection of A.A.R. de Meijer) and SP herbaria. Type specimens were requested on loan to herbaria BPI, ENCB, FH, NY, O, PC, and UPS. Herbarium abbreviations follow Holmgren et al. (1990).

Macro and micromorphological observations

Key colors are from Kornerup & Wanscher (1963). Micromorphological observations were made from material mounted in 10% KOH and Melzer's reagent using a 100× oil-immersion objective in Zeiss K7 or Zeiss Axioskop 40 microscope. Basidiospore shape is based on the Q ratio (length/broad ratio; Bas 1969: 320–321) of 20 randomly selected mature basidiospores. Although basidiospores were examined using Axio Vision 4 software with the Zeiss Axioskop 40 microscope with 1600× magnification, the details can also be observed with 1250× magnification).

Main macromorphological features for delimiting species included spongy versus woody basidiomata; pileus crust thickness and hardness; width, color stratification (homogeneous, not fully homogeneous, or duplex), and resinous deposits of the context (Gottlieb & Wright 1999a,b; Steyaert 1980). In duplex context there is an abrupt change,

with two separate, contrasting colors; 'not fully homogeneous' is used when there is an evident but gradual color difference between the upper and lower parts without abrupt color changes. Resinous deposits are hard and brittle substances, which may be dull or shiny and continuous (lines) or discontinuous (incrustations) (Torres-Torres & Guzmán-Dávalos 2012). Main micromorphological features taken into consideration were basidiospore size and apex, disposition and size of basidiospore pillars, and size, shape, and incrustations of the pileipellis cells (Bazzalo & Wright 1982; Gottlieb & Wright 1999a,b; Steyaert 1967, 1980). Basidiospore pillars can be free, subfree, partially anastomosed, or anastomosed. Free pillars appear as independent dots on the basidiospore surface; subfree is when free dots are mixed with two fused pillars or with shortly elongated structures. The term partially anastomosed is used when ≥ two pillars grow together to form an irregular surface. Terms and concepts used in the descriptions are defined in Torres-Torres & Guzmán-Dávalos (2012).

Results

We reviewed Brazilian specimens associated with almost all vegetation types present in Brazil and deposited in EMBRAPA and SP and further checked specimens (including 20 types) deposited in other herbaria. Specifically, four Brazilian type specimens were compared with 16 types from Belize, Colombia, Cuba, Ecuador, Finland, France, Grenada, Guinea, Mexico, Nicaragua, Panama, USA, and Venezuela.

We report 18 *Ganoderma* species from Brazil, including three (*G. mexicanum*, *G. perzonatum*, *G. pulverulentum*) that are new records for Brazil and one (*G. weberianum*) recorded for the first time in America. *Ganoderma mexicanum*, *G. perturbatum* and *G. perzonatum* are recorded for the first time since their original description. An identification key to the *Ganoderma* species studied for this paper is presented. Complete descriptions and illustrations for species with laccate pileus surface (excluding *G. vivianimercedianum,* which was recently described elsewhere) are given; only micromorphological data are provided for all species with dull surfaces, except that *G. amazonense* and *G. brownii* are completely described because both species lack modern descriptions. *Ganoderma applanatum* and *G. australe* are not described because both are quite common and widely covered in the literature (Baltazar & Gibertoni 2009, Gibertoni & Cavalcanti 2003, Loguercio-Leite et al. 2005, Pegler & Young 1973, Steyaert 1975, Tellería 1980).

Key to *Ganoderma* spp. from Brazil studied in this work

1. Pileus dull 2
1. Pileus glossy 5
2. Context brown 3
2. Context pale, not fully homogeneous; basidiospores 7–9 × 5–7 μm, with free pillars . . . . . *G. amazonense*

3. Pileus crust very hard, generally ≥ 0.5 mm thick; context with resinous bands; basidiospores 8–13 × 6–7 µm 4
3. Pileus crust hard, generally ≤ 0.5 mm thick; context without resinous bands; basidiospores 7–9 × 5–6 µm . . . . . *G. applanatum*

4. Basidiospores with free, 0.3–0.4 µm thick inter-walled pillars . . . . . *G. australe*
4. Basidiospores with anastomosed, 0.5–0.8 µm thick inter-walled pillars . . . *G. brownii*

5. Basidiomata stipitate; basidiospores with subacute apex. 6
5. Basidiomata sessile to stipitate; basidiospores with truncate apex. 8

6. Context not fully homogeneous, brown; pileipellis cells without granulations 7
6. Context duplex, light orange or brownish orange above and light brown to brown below; pileipellis cells with or without granulations . . . . . *G. dorsale*

7. Pileipellis cells entire; basidiospores 10–13 × 8–10 µm . . . . . *G. perturbatum*
7. Pileipellis cells with up to four protuberances; basidiospores 10–13 × 5–7 µm . . . . . *G. elegantum*

8. Context pale in general, sometimes with a narrow darker zone towards the tubes 9
8. Context light brown to brown 14

9. Context homogeneous to not fully homogeneous but not duplex; basidiospores 8–10 × 6–7 µm, with free or subfree pillars 10
9. Context duplex; basidiospores 11–14 × 7–9 µm, with free pillars . . . . . *G. sessile*

10. Context without resinous deposits; pileipellis cells clavate, without granulations . . . . . *G. sessiliforme*
10. Context with resinous deposits; pileipellis cells cylindrical to narrowly clavate, with granulations 11

11. Pileus surface soft, easy to penetrate with the fingernail 12
11. Pileus surface hard, difficult to penetrate with the fingernail 13

12. Pileipellis cells with concentric elongate granulations in the apex; basidiospores 8–10 × 6–7 µm, with free pillars . . . . . *G. perzonatum*
12. Pileipellis cells without concentric elongate granulations in the apex; basidiospores 9–12 × 6–8 µm, with subfree pillars . . . . . *G. vivianimercedianum*

13. Context changing to yellow when cut, not fully homogeneous; basidiospores with subfree pillars. . . . . *G. weberianum*
13. Context unchanging, homogeneous; basidiospores with free pillars. . . . *G. parvulum*

14. Context homogeneous; pileipellis cells entire, almost cylindrical to cylindrical; basidiospores 11–13 × 6–7 µm, with free pillars . . . . . *G. resinaceum*
14. Context not fully homogeneous 15

15. Pileipellis cells entire. 16
15. Pileipellis cells with protuberances or branches 17

16. Basidiospores 9–11 × 6–7 µm, with subfree pillars . . . . . *G. mexicanum*
16. Basidiospores 9–13 × 6–8 µm, with partially anastomosed pillars. . . . . *G. pulverulentum*

17. Pileipellis cells with up to 14 lateral or apical protuberances; basidiospores 8–10 × 6–7 µm, with free pillars . . . . . *G. multiplicatum*

17. Pileipellis cells with up to 10 lateral or apical protuberances or branches; basidiospores 9–13 × 6–8 µm 18

18. Pileipellis cells usually with a constriction, generally with ≤5 protuberances and 1–2 branches, apex with ferruginous granulations; basidiospores with free pillars. . . . . *G. subfornicatum*

18. Pileipellis cells irregular, with ≤10 lateral or apical protuberances or branches, without granulations in the apex; basidiospores with subfree pillars . . . . .*G. orbiforme*

Brazilian species

Ganoderma amazonense Weir, U.S. Dep. Agr. Bull. 1380: 12, 84 (1926).

Basidiomata 7.5–9.5 × 5–9.5 × 2–3 cm, perennial, sessile to substipitate, usually with a narrow base, occasionally imbricate, woody. Pileus round-flabelliform to circular, slightly convex to generally applanate; surface glabrous, bumpy, dull; with a hard crust, difficult to penetrate with the fingernail; surface reddish-brown (8E6); margin white, lobulate, thin. Context 1.5–2 cm thick, fibrous, not fully homogeneous, pale in general, pale orange to light orange (5A3, 5A4) above, gradually changing to light brown (6D7) toward tubes, zonate; without resinous deposits. Pores 3–5 per mm, angular to round, woody; pore surface yellow (3A2) to chrome-yellow (2A8) when fresh, darkening to ochraceous when aging and drying; tubes 0.4–0.5 cm thick, unstratified to stratified, concolorous with the lower part of the context. Hyphal system dimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 3–5 µm diam., generally solid to thick-walled, non-septate, unbranched, hyaline to light yellow. Pileipellis an irregular crustotrichoderm; hyphal ends impregnated in a resinous substance, entire, solid, golden-yellow. Basidiospores 8–9 × (5–)6–7 µm, Q = 1.23–1.38, widely ellipsoid to ellipsoid, apex truncate, light yellow, inamyloid; perisporium wrinkled, hyaline; exosporium with inter-walled pillars up to 0.3 µm thick, free. Basidia not observed. Cystidia absent.

Habitat: Tropical secondary vegetation, tropical rainforest, plantation of *Hevea brasiliensis*.

Material examined: **BRAZIL**, **Pará**, Cocal Grande, on *Spondias lutea* in *Hevea brasiliensis* plantation, 20 August 1923, J.R. Weir s.n. (BPI 62043, lectotype). **COLOMBIA**, **Chocó**, Municipality of Atrato, Yuto, 27 September 2002, M.G. Torres-Torres 131 (XAL, CHOCO), **COSTA RICA**, **Cartago**, Turrialba, La Central, without date, A. Jiménez s.n. (USJ 66156); **Puntarenas**, Osa, Sierpe, Corcovado National Park, 24 February 2000, E. Fletes 1296 (INB).

Remarks: The remarkable features of *G. amazonense* are its dull pileus, pale context, and small light yellow basidiospores. Although we did not check other materials from Brazil except for the type specimen, we examined collections

Figs. 1-15. Basidiomata of *Ganoderma*. **1**. *G. brownii* (SP214649). **2–3**. *G. dorsale* (SP45190, SP45819). **4**. *G. elegantum* (SP211483). **5**. *G. mexicanum* (SP109514). **6**. *G. multiplicatum* (SP211484). **7**. *G. orbiforme* (SP211911). **8**. *G. parvulum* (NY type). **9**. *G. perturbatum* (SP60278). **10**. *G. perzonatum* (SP50687). **11**. *G. pulverulentum* (SP103257). **12**. *G. resinaceum* (SP61535). **13**. *G. sessiliforme* (SP61432). **14**. *G. subfornicatum* (SP375899). **15**. *G. weberianum* (SP61099). Bar = 1cm.

from Colombia and Costa Rica. Slightly smaller basidiospores were described by Gottlieb & Wright (1999b; 7–8 × 5–6 μm), Ryvarden (2004; 7–8 × 5–6 (–7) μm), and Gomes-Silva et al. (2011; (6–)7–8 × 5–6(–7) μm), while Welti & Courtecuisse (2010) cited measurements (8–9 × 6–7 μm) that agree with ours. *Ganoderma amazonense* has been recorded from other Brazilian localities as well as from several neotropical countries and Africa (e.g., Furtado 1967; Gomes-Silva & Gibertoni 2009; Gomes-Silva et al. 2011; Ryvarden 2004; Steyaert 1980; Welti & Courtecuisse 2010). The Asian records (e.g., Corner 1983) are doubtful (see Welti & Courtecuisse 2010).

Ganoderma applanatum (Pers.) Pat., Hyménomyc. Eur.: 143 (1887) [nom. cons.].

= *Ganoderma lipsiense* (Batsch) G.F. Atk., Ann. Mycol. 6: 189 (1908).

Basidiospores 7–9.6 × 5.6–6.4 μm, Q = 1.4–1.57, ellipsoid, apex truncate, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars 0.3–0.4 μm thick, free.

Habitat: Rain forest, secondary forest.

Material examined: **BRAZIL**, **Paraná**, Curitiba, São José dos Pinhais, ADEA Reserva Biológica Cambuí, on dead palm trunk, 4 March 1980, A.A.R. de Meijer 386 (EMBRAPA); Antonina, Marumbí, Parque Marumbí, Rio do Nune, on dead dicotyledonous trunk, 12 December 1987, A.A.R. de Meijer 962A (EMBRAPA).

Remarks: A very common species with a wide distribution, *G. applanatum* is characterized by a pileus crust <0.5 mm thick, a context without resinous deposits, and small basidiospores. For a complete description, refer to Kotlaba & Pouzar (1971), and Telleria (1980).

Ganoderma australe (Fr. : Fr.) Pat., Bull. Soc. mycol. Fr. 5: 71 (1889).

≡ *Polyporus australis* Fr. : Fr., Elench. Fung. 1: 108 (1828).

= *Ganoderma tornatum* (Pers.) Bres., Hedwigia 53: 55 (1912).

Basidiospores 8.4–12 × 6–7.2 μm, Q = 1.4–1.57, ellipsoid, apex truncate, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars 0.3–0.4 μm thick, free.

Habitat: Dense ombrophilous forest.

Material examined: **BRAZIL**, **Paraná**, Curitiba, São José dos Pinhais, ADEA Reserva Biológica Cambuí, 3 February 1979, A.A.R. de Meijer 23 (EMBRAPA); on stump, 15 July 1979, A.A.R. de Meijer 98 (EMBRAPA).

Remarks: The main characteristics of *G. australe* are a very hard pilear crust thicker than 0.5 mm (although young specimens may have a thinner but hard crust) and a context with resinous deposits. *Ganoderma applanatum*differs in smaller basidiospores and a thinner pilear crust. Although a cosmopolitan species, occurrences of *G. australe* are often underestimated because of wrong determinations. Studied specimens agree with the descriptions [some cited as *G. tornatum*] of Gottlieb & Wright (1999b), Kotlaba & Pouzar (1971),

Melo (1986), Núñez & Ryvarden (2000), Pegler & Young (1973), Ryvarden & Johansen (1980), Steyaert (1967, 1975), Tellería (1980); refer to these authors for a complete description.

Ganoderma brownii (Murrill) Gilb., Mycologia 53: 505 (1962 ["1961"]). Fig. 1

Basidiomata 6.5–16 × 6.5–15 × 1.4–2 cm, perennial, sessile, occasionally imbricate, woody. Pileus round-flabelliform to circular, generally applanate; surface glabrous, bumpy, dull, concentrically sulcate; with a 0.6–0.8 mm thick crust, not cracking, very hard, difficult to penetrate with the fingernail; surface brown (7F7); margin concolorous, entire, thin to thick, obtuse, sulcate. Context 0.3–0.9 cm thick, fibrous, homogeneous, reddish-brown (9F8), azonate; generally with resinous deposits close to the pileus' base. Pores 4–5 per mm, angular to round, woody; pore surface yellow (3A2) to chrome-yellow (2A8); tubes 0.4–1.5 cm thick, unstratified to stratified, concolorous with the lower part of the context. Hyphal system trimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 3.7–9.3 μm diam., generally solid to thick-walled, non-septate, arboriform, yellowish-brown; no binding hyphae were observed. Pileipellis a crustotrichoderm; terminal elements 6.8–9.3 μm wide, with apex 7–10 μm wide, entire, solid, golden-yellow. Basidiospores 9.3–11.2 × 6.6–7.4 μm, Q = 1.25–1.5, widely ellipsoid to ellipsoid, apex truncate, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars 0.5–0.8 μm thick, anastomosed. Basidia not observed. Cystidia absent.

Habitat: Atlantic dense ombrophilous rain forest.

Material examined: **USA**, **California**, Strawberry Canyon, on dead *Umbellularia*, November 1910, V.S. Brown 307 (NY, lectotype). **BRAZIL**, **São Paulo**, Reserva Biológica de Paranapiacaba, 25 August 1987, M. Capelari 1723 (SP214649).

Remarks: This species is characterized by its very hard, >0.5 mm thick pileus crust, reddish-brown context, yellow pore surface, and large broadly ellipsoid to ellipsoid basidiospores. Although Gilbertson & Ryvarden (1986) suggest that *G. brownii* is restricted to California, the Brazilian specimen agrees with the lectotype, which has basidiospores 9–12 × 6.5–8 μm. As Bononi et al. (2008) recorded the species from Mato Grosso do Sul, this represents a second record for Brazil. Gottlieb & Wright (1999b) cite *G. brownii* as a synonym of *G. lipsiense,* but we consider *G. applanatum*/*G. lipsiense* as separate (cf. the two descriptions).

Ganoderma dorsale (Lloyd) Torrend, Brotéria, sér. Bot. 18: 32 (1920). Figs 2–3, 16–17

= *Ganoderma concinnum* Ryvarden, Mycologia 92: 183 (2000).

Basidiomata 2–5.5 × 3–10 × 0.5–1.5 cm, annual, stipitate, woody-corky. Pileus round-flabelliform to reniform, convex to generally applanate; surface glabrous, bumpy, semiglossy to glossy, concentrically sulcate; with a laccate

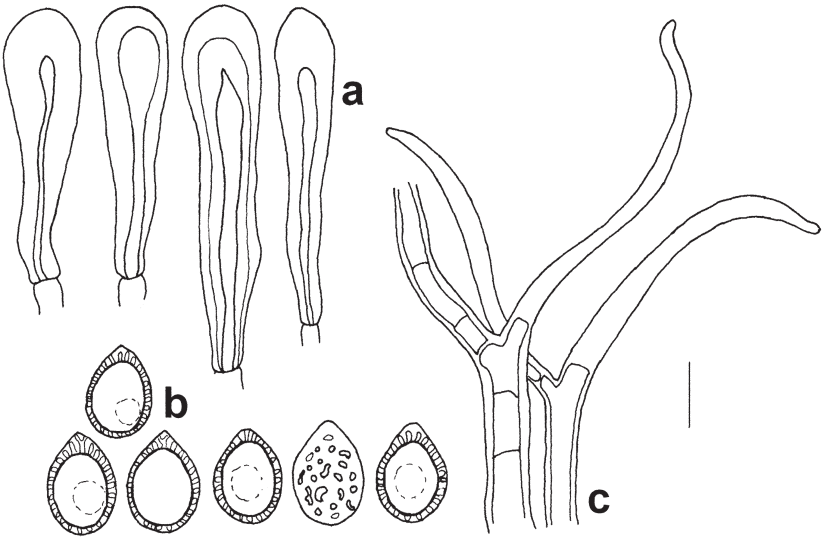

Fig. 16. *Ganoderma dorsale* (SP45190). Bar = 8 μm.
a. Pileipellis cells. **b**. Basidiospores. **c**. Skeletal hyphae of crustohymeniderm.

crust, not cracking, difficult to remove, easy to penetrate with the fingernail; surface garnet-red (11E8) or violet-brown (11F8), almost homogeneous in the adult; margin yellowish to concolorous, entire, acute to obtuse, smooth to sulcate. Stipe 3.5–10 × 0.3–1.5 cm, lateral, cylindrical, solid, context duplex as basidiomata context; surface smooth to tuberculate, generally very shiny, red-wine almost black, generally darker than the pileus. Context 0.2–0.6 cm thick, up to 1.2 cm in pileus' base, fibrous, duplex, pale-orange to light-orange (5A3, 5A4) to brownish orange or caramel (6C6) above, brown (lighter than 6F8) to light brown (6D7) toward tubes, azonate; generally with resinous bands very thin and inconspicuous, only one specimen with thick lines; stipe context also duplex. Pores 4–8 per mm, angular to round, woody; pore surface yellow (3A2); tubes 0.1–0.7 cm thick, unstratified, concolorous with the lower part of the context. Hyphal system trimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 3.1–12 μm diam., solid to generally thick-walled, apex septate, arboriform, yellow to yellowish-brown; binding hyphae 1.9–3.1 μm diam., thick to solid, non-septate, yellowish, scarce. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 46–72 × 7.2–13.6 μm, narrowly clavate to clavate, entire or with one lateral protuberance; thick-walled, golden-brown, with or without granulations in the apex; dextrinoid. Basidiospores 11.8–14 × 8–9.3(–10) μm, Q = 1.4–1.65, ellipsoid, apex subacute, yellowish-brown, inamyloid; perisporium wrinkled,

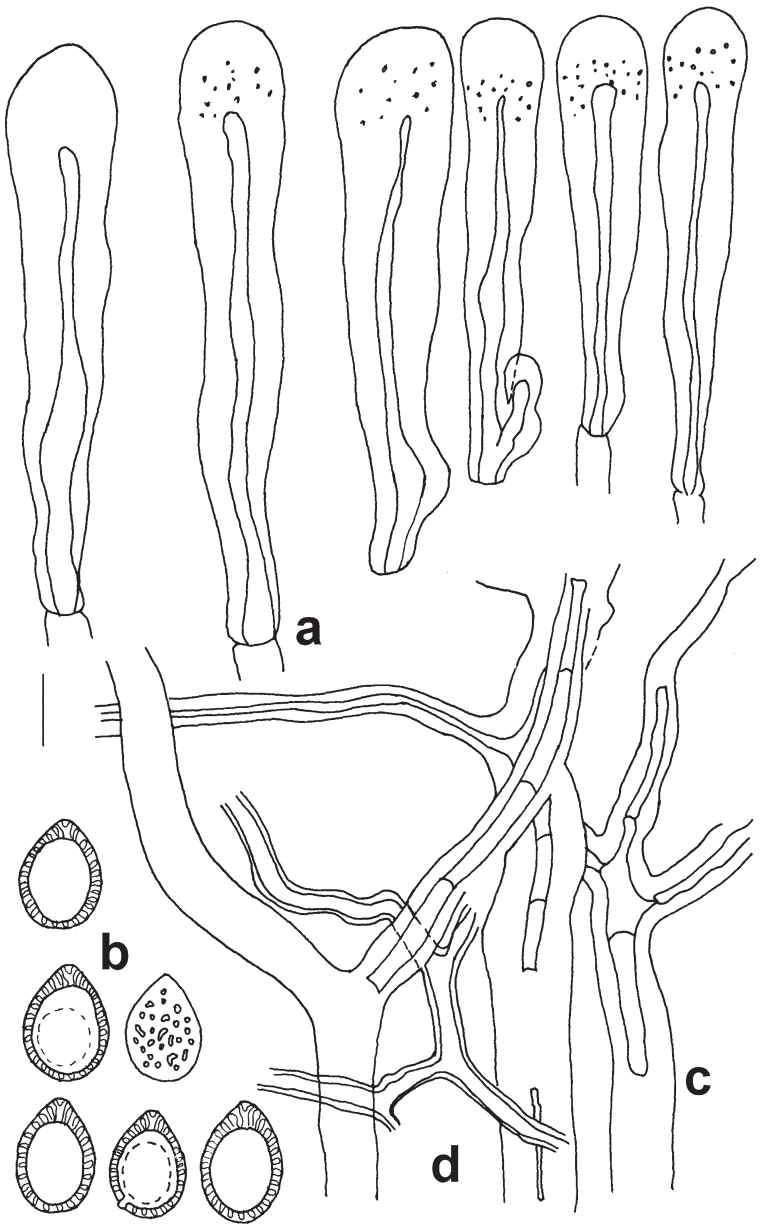

Fig. 17. *Ganoderma dorsale* (SP45819). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores.
c–**d**. Crustohymeniderm: **c**. Skeletal hyphae. **d**. Binding hyphae.

reddish-brown; exosporium with inter-walled pillars 0.5–0.6 µm thick, partially anastomosed; with apical germ pore difficult to observe. Basidia not observed. Cystidia absent.

Habitat: Seasonal semi-deciduous forest, seasonal semi-deciduous submontane forest, seasonal semi-deciduous alluvial forest, tropical rain forest.

Material examined: **BRAZIL**, **Rio Grande do Sul**, on buried wood, without date, R.J. Rick s.n. (BPI 303197, holotype); **Paraná**, Curitiba, Centro Politécnico, Jardim das Americas, on buried roots of living dicotyledonous tree, 18 January 1989, A.A.R. de Meijer 1194 (EMBRAPA); Parque Boriquí, on soil, 5 March 1993, A.A.R. de Meijer 2533 (EMBRAPA); Reserva Biológica Cambuí, on forest soil, 24 November 1994, A.A.R. de Meijer 2961 (EMBRAPA); Reserva Biológica Cambuí, on buried dicotyledonous, 20 May 1995, A.A.R. de Meijer 2278 (EMBRAPA); Jundiaí do Sul, Fazenda Monte Verde, on decayed dicotyledonous, on buried wood, 4 February 1996, A.A.R. de Meijer 3253 (O, EMBRAPA); **Rio Grande do Sul**, Pelotas, Horto Florestal, buried, 9 June 1959, E.C. Santos 29 (SP45190); **São Paulo**, Iepe, about 5 km of Porto Alvarado, along of the Rio Paranapanema, Fazenda CAPI, 9 February 1965, G. Eiten, L.T. Eiten & H. Kimura 6009 (SP102607). **COLOMBIA**, **Chocó**, Municipality of Riosucio, Sautatá, Parque Nacional Katios, 28–30 June 1978, L. Ryvarden 18640 (O, holotype of *G. concinnum*).

Remarks: *Ganoderma dorsale* is characterized by its stipitate basidiome, duplex context, and basidiospores with subacute apex. Examined specimens agree with the holotype and with the description by Gottlieb & Wright (1999a, as "*Ganoderma lucidum* var. *dorsale*"). Although Moncalvo & Ryvarden (1997) reported this species as common in Brazil and recorded it also from Malaysia and Philippines, it was not included in the most recent treatment of neotropical polypores (Ryvarden 2004). Baltazar & Gibertoni (2009) reported it from the Brazilian Atlantic forest. The species was considered a synonym of *G. perturbatum* by Steyaert (1967) and of *G. lucidum* s.l. by Ryvarden (1990). The two specimens in SP (SP45190, SP102607) were labeled *G. lucidum* and possibly published under the same name. *Ganoderma concinnum* is considered a synonym of *G. dorsale* because it also has a stipitate basidiome, duplex context, and basidiospores with subacute apex. The only differences found are granulations of the pileipellis cells and absence of resinous bands in the context in *G. dorsale*, not enough to support two separate species. Ryvarden (2000) suggested that the long stipe distinguished *G. dorsale* from *G. concinnum*; however, there are specimens with very short stipes that agree well with the *G. dorsale* concept (e.g., SP45190 and SP102607). Moreover, Ryvarden (2000) described larger (12–14 × 7–8 µm) basidiospores than we measured (8–10 µm wide) in the *G. concinnum* holotype. *Ganoderma concinnum* has been recorded from Brazil by Baltazar & Gibertoni (2009), de Meijer (2006), and Ryvarden & de Meijer (2002). *Ganoderma perturbatum,* which is also stipitate and produces basidiospores with a subacute apex and partially anastomosed pillars, is otherwise easily distinguished (cf. *G. perturbatum*).

Ganoderma elegantum Ryvarden, Syn. Fung. 19: 81 (2004). FIGS 4, 18

BASIDIOMATA 1.7 × 2 × 1 cm, annual, stipitate, woody-corky. Pileus round-flabelliform, applanate; surface glabrous, glossy, concentrically sulcate; with a laccate crust, not cracking, easy to penetrate with the fingernail; surface

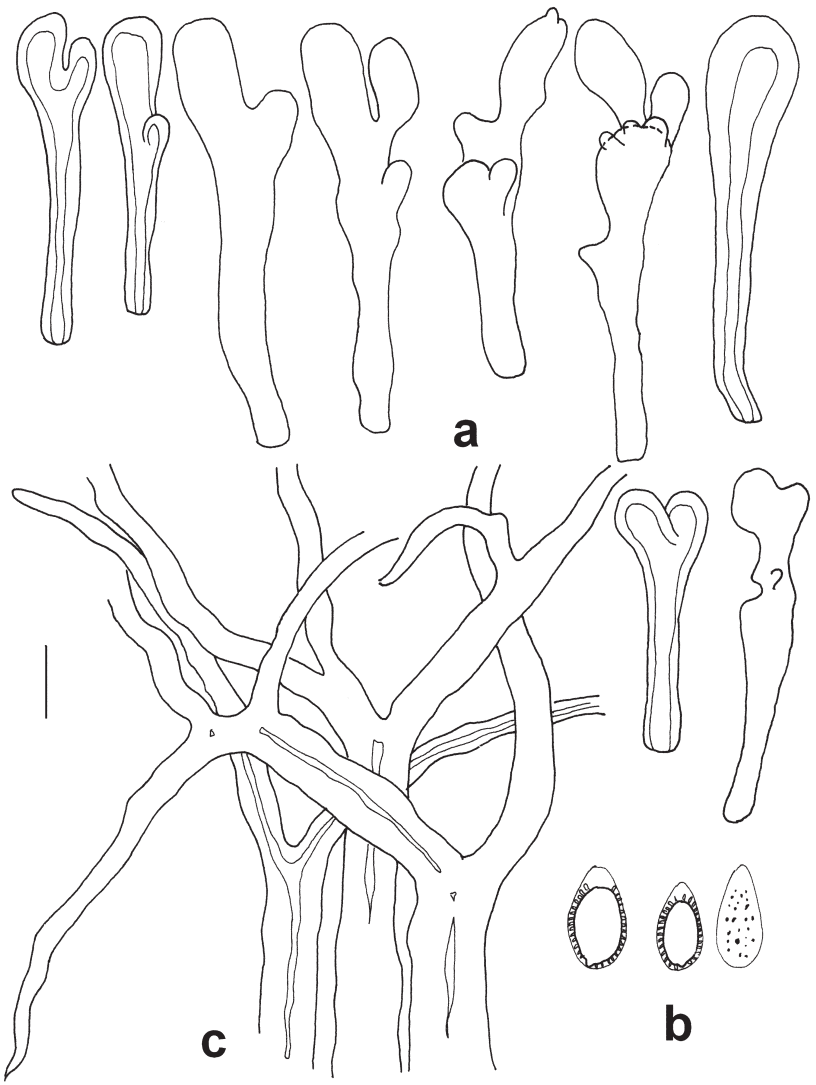

FIG. 18. *Ganoderma elegantum* (SP211483). **a**. Pileipellis cells. **b**. Basidiospores. **c**. Crustohymeniderm: skeletal hyphae.

homogeneous reddish-brown (11F8); margin whitish, entire, obtuse to acute, smooth. Stipe 8.7 × 1.3 cm, lateral, cylindrical, solid; surface smooth, very shiny, red-wine almost black, darker than pileus. Context 0.9 cm thick, spongy-fibrous, not fully homogeneous, yellowish-brown (5E8) to eye-brown (7F7), azonate; with resinous bands that do not extend up to the margin. Pores 6–7 per mm, angular to round, woody; pore surface yellowish (2A3); tubes 0.1 cm thick, unstratified, concolorous with the lower part of the context. Hyphal system dimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 2.5–8.7 μm diam., solid to generally thick-walled, non-septate, arboriform, yellow to yellowish-brown. Hymenophoral trama: no generative hyphae were observed; skeletal hyphae 2.5–6.2 μm diam., solid to generally thick-walled, non-septate, arboriform, yellow to yellowish-brown. Pileipellis a crustohymeniderm, cells 29.8–52.7 × 6.2–10.5 μm, clavate, entire or with up to six lateral or apical branches or protuberances; subthick-walled, golden-yellow, without granulations in the apex; negative or apex slightly amyloid. Basidiospores 10–12 × 5–7 μm, Q = 1.4–1.65, oblong to ellipsoid, apex subacute, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars up to 0.3 μm thick, subfree; endosporium wrinkled; with apical germ pore difficult to observe. Basidia not observed. Cystidia absent.

Habitat: Amazonian rain forest.

Material examined: **ECUADOR**, Yasuni National Park, Yasuni Scientific Reserve, on dead hardwood log, 12 March 2002, Ryvarden 44573 (O, holotype). **BRAZIL**, **Rondônia**, Jarú, near the airport, on wood, 10 October 1986, M. Capelari & R. Maziero 962 (SP211483).

Remarks: *Ganoderma elegantum* was recently described from Ecuador (Ryvarden 2004) and recorded in a checklist from Brazilian Amazonia by Gomes-Silva & Gibertoni (2009; based on a specimen determined by Torres-Torres in 2005). Although the Brazilian specimen cited above has many immature basidiomata with few basidiospores, the features agree in general with the holotype. Ryvarden (2004) described apically widened pileipellis cells without protuberances, but we observed up to six lateral or apical branches or protuberances per cell in both the holotype and Brazilian specimens.

Ganoderma mexicanum Pat., Bull. Soc. mycol. Fr. 14: 54 (1898). Figs 5, 19

Basidiomata 6.2–11.2 × 9–19 × 1.6–2.5 cm, annual, sessile, woody, but light in weight when dry. Pileus round-flabelliform to semicircular, convex to applanate; surface glabrous, rugose, semiglossy; with a laccate crust, thin, not easily cracked or removed, but easy to penetrate with the fingernail, concentrically sulcate; surface reddish-black in a 80% of the surface to brown-violet (11F5) towards the margin, almost homogeneous; margin henna (7E8) to concolorous with the pileus, slightly lobulate, thin to thick, obtuse, smooth.

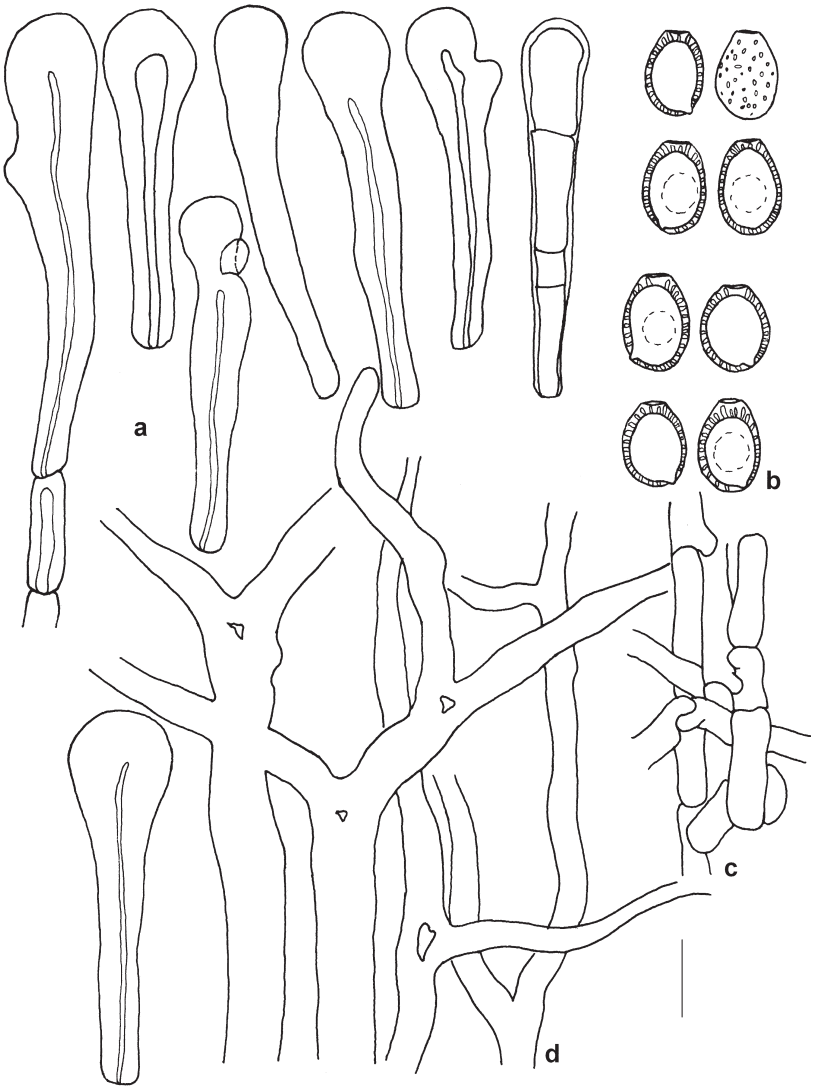

Fig. 19. *Ganoderma mexicanum* (SP109514). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores.
c–**d**. Crustohymeniderm: **c**. Generative hyphae. **d**. Skeletal hyphae.

Context 0.4–0.8 cm thick, fibrous, not fully homogeneous, pale-orange to light brown (5A3, 5B6) in the upper portion, brown or cognac (6E7) toward the tubes, azonate; with resinous bands up to half of the context. Pores 3–5

per mm, round, woody; pore surface pale yellow (2A3); tubes 0.8–1.1 cm thick, unstratified, concolorous with the lower part of the context. Hyphal system dimitic. Contextual trama: generative hyphae 1.8–5 μm diam., thin-walled, hyaline, non-branched; skeletal hyphae 1.9–9.3 μm diam., thick-walled to generally solid, non-septate, arboriform, yellowish. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 35.2–72.4 × 6.8–10.5 μm, clavate to narrowly clavate, some apically widened, entire or rarely with one lateral protuberance; very thick-walled, golden-brown to yellowish-brown, without granulations in the apex; dextrinoid. Basidiospores 9.3–10.6 × 6.2–7.4 μm, Q = 1.42–1.54, ellipsoid, apex truncate, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars 0.3 μm thick, subfree. Basidia not observed. Cystidia absent.

Habitat: Not specified.

Material examined: **MEXICO**, **Estado de México**, D. de Jonacatepec, Tepalcingo, 22 October 1890, s. coll. (FH, lectotype). **BRAZIL**, **São Paulo**, Tremembé, Horto Florestal de Cantareira, on trunk of *Araucaria angustifolia*, 3 March 1953, C.D.F. Pacheco s.n. (SP109514).

Remarks: The most important features of *G. mexicanum* are a not fully homogeneous context, apically widened pileipellis cells, and small basidiospores with subfree pillars. The studied specimen agrees with the lectotype, which, however, "seems" to have a homogenous context without resinous bands. A possible explanation is that the type is poorly conserved with most of the context destroyed. This species was previously known only from the type locality (Patouillard 1898). This is the second record of the species for the world.

Ganoderma multiplicatum (Mont.) Pat., Bull. Soc. mycol. Fr. 5: 74 (1889). Figs 6, 20

Basidiomata 5–7 × 4–12 × 1–3 cm, perennial, sessile to substipitate, woody. Pileus round-flabelliform with a contracted base, slightly convex to applanate; surface glabrous, smooth to bumpy, glossy; with a laccate crust, thin, not easily cracked or removed, but easy to penetrate with the fingernail, concentrically sulcate; surface very dark reddish-black to dark violet-brown (11F5) in 80–90% of the pileus, the remaining area rust-brown (6E8) to dark orange (5B8); margin whitish, entire to slightly lobulate, obtuse, smooth. Context 0.6–0.9 cm thick, fibrous, not fully homogeneous, light yellowish-brown changing to light brown (6D7) toward the tubes, zonate; with resinous bands. Pores 4–6 per mm, angular to round, woody; pore surface pale yellow (2A3); tubes 0.4–0.8 cm thick, unstratified, concolorous with the lower part of the context. Hyphal system dimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 3.8–7.5 μm diam., subthick-walled to generally solid, non-septate, arboriform, yellow. Hymenophoral trama: generative hyphae 2–3.8 μm diam., thin-walled, hyaline, abundant; skeletal hyphae

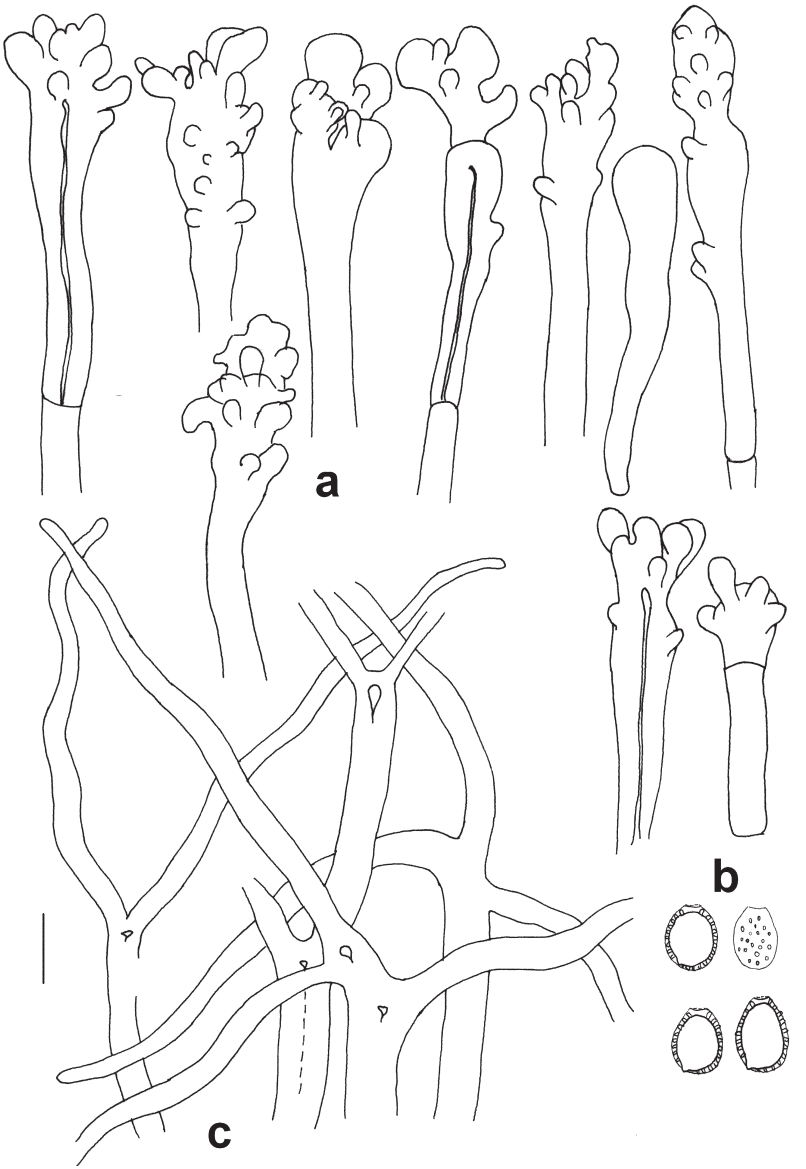

Fig. 20. *Ganoderma multiplicatum* (SP211484). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores.
c. Crustohymeniderm: skeletal hyphae.

2.2–3.8 μm diam., subthick-walled to generally solid, non-septate, arboriform, yellow to yellowish-brown. Pileipellis a crustohymeniderm, cells 38.5–62 × 5.6–10 μm, clavate, narrowly clavate or irregular, with up to 14 lateral or apical protuberances; very thick-walled, golden-yellow, without granulations in the apex; amyloid. Basidiospores 8–9.9 × 6.2–6.8 μm, Q = 1.3–1.47, ellipsoid, apex truncate, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars up to 0.3 μm thick, free. Basidia not observed. Cystidia absent.

Habitat: Atlantic rain forest, Amazonian rain forest.

Material examined: **BRAZIL**, **Alagoas**, Maceió, Reserva do Ibama, 28 August 1992, R. Maziero s.n. (SP250605); **Rio de Janeiro**, Mata de Tijuca, 4 May 1966, J.S. Furtado s.n. (SP91404); **Rondônia**, Jarú, right margin of Rio Jarú, 3 October 1986, M. Capelari & R. Maziero 693 (SP211484); **São Paulo**, Parque do Estado, Instituto de Botânica, on wood, 23 January 1970, B. Skvortzov s.n. (SP10746); **Sergipe**, Estação Ecológica Santa Isabel, 9 December 2003, R.H. Marino s.n. (SP375895).

Remarks: *Ganoderma multiplicatum* is characterized by a reddish-black pileus, a not fully homogenous context, small basidiospores, and pileipellis cells with many protuberances. The cited specimens agree with Gottlieb & Wright (1999a) and Ryvarden (2000, 2004), except that the last author described pileipellis cells lacking or with only a few small apical protuberances. However, Gottlieb & Wright (1999a) described pileipellis cells in the type as "elongated acanthophysis-like elements," and the cells we found in the Brazilian specimens are very similar to their illustrations. This species was described from French Guiana and recorded from Angola, Argentina, Brazil, India, Indonesia, Ivory Coast, Seychelles, Sierra Leone, Zaire and Zambia (Baltazar & Gibertoni 2009; Gomes-Silva & Gibertoni 2009; Gomes-Silva et al. 2011; Gottlieb & Wright 1999a; Ryvarden 2000; Steyaert 1980). According to Ryvarden (2000), it has a pantropical distribution. Some EMBRAPA and SP specimens were labeled *G. lucidum*.

Ganoderma orbiforme (Fr.) Ryvarden, Mycologia 92: 187 (2000). Figs 7, 21

Basidiomata 4–6.5 × 5–8 × 1.5–2 cm, perennial, sessile, occasionally imbricate, woody. Pileus round-flabelliform, convex to applanate; surface glabrous, bumpy, glossy; with a laccate crust, thin, not easily cracked or removed, but easy to penetrate with the fingernail, concentrically sulcate; surface very dark reddish-black in 80–90% of the surface to light-brown (6D8) toward the margin; margin light-brown (6D8), entire, obtuse, generally sulcate. Context 0.8–1 cm thick, fibrous, not fully homogeneous, light golden-brown (5D) to rust-brown (6E8) toward the tubes, zonate; with discontinuous resinous bands. Pores 4–8 per mm, round, woody; pore surface yellow (3A6); tubes 0.7–0.9 cm thick, unstratified to stratified, concolorous with the lower part of the context. Hyphal system trimitic. Contextual trama: no generative hyphae

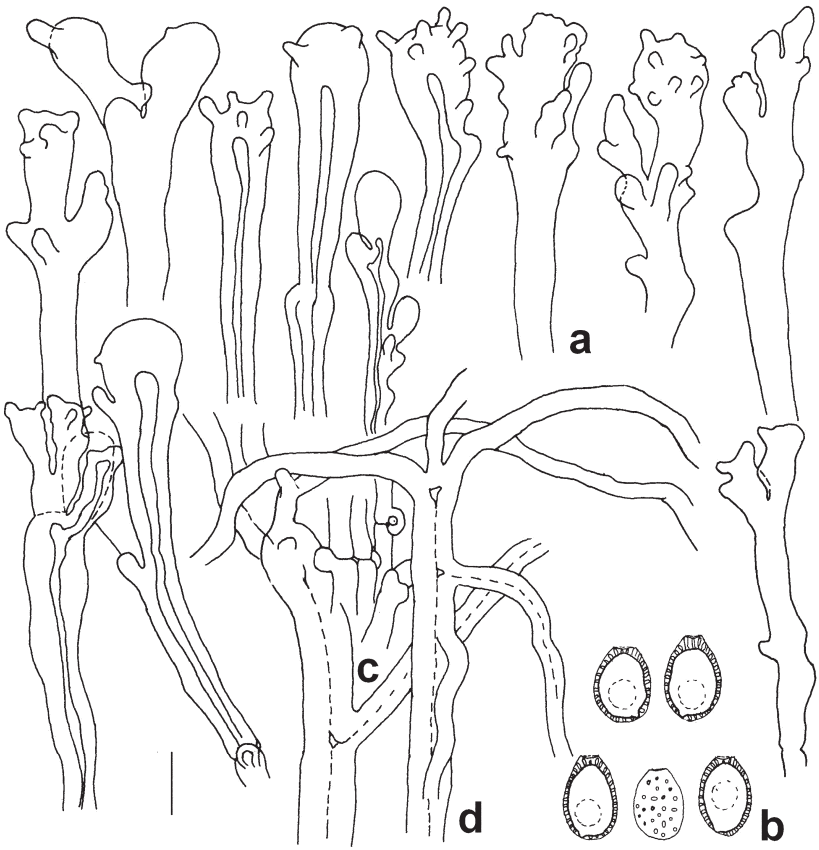

Fig. 21. *Ganoderma orbiforme* (SP211911). Bar = 8 μm.
a. Pileipellis cells. **b**. Basidiospores.
c–**d**. Crustohymeniderm: **c**. Generative hyphae. **d**. Skeletal hyphae.

were observed; skeletal hyphae 2.5–8.8 μm diam., generally solid, non-septate, arboriform, yellow to yellowish-brown. Hymenophoral trama: generative hyphae 2.5–5 μm diam., thin-walled, hyaline, branched; skeletal hyphae 2.5–8 μm diam., generally solid, non-septate, arboriform, golden-yellow to yellowish-brown; binding hyphae 1.9–2.5 μm, thick-walled, hyaline to yellowish, scarce. Pileipellis a crustohymeniderm, cells 33.5–62 × 4.4–9.3 μm, irregular, with up to 10 lateral or apical protuberances or branches; thick-walled, golden-yellow to golden-brown, without granulations in the apex; strongly amyloid. Basidiospores 9–11.2(–13) × 6.9–8(–8.6) μm, Q = 1.38–1.5, ellipsoid, apex truncate, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown;

exosporium with inter-walled pillars 0.4–0.5 μm thick, subfree. Basidia not observed. Cystidia absent.

Habitat: Atlantic rain forest, artificial *Pinus* forest.

Material examined: **GUINEA**, without data, A. Afzelius s.n. (UPS, holotype). **BRAZIL**, **Rio de Janeiro**, Angra de Reis, Ilha da Gilpoia, 4 March 1956, O. Fidalgo F-365 (SP95346); **Paraná**, Paranaguá, Ilha do Mel, on dead standing trunk of *Ocotea pulchella*, 6 May 1989, A.A.R. de Meijer 1234 (EMBRAPA); **São Paulo**, Água Funda, Secretaria de Agricultura, on trunk of *Pinus* sp., 31 March 1986, M.A. de Jesus s.n. (SP211911); Trilha do Jardim Botânico de São Paulo, 12 February 2004, A.M. Gugliotta & G.R. Leal 1205 (SP382045).

Remarks: *Ganoderma orbiforme* is characterized by a very dark (almost black) pileus, not fully homogenous context, pileipellis cells with many protuberances and branches, and basidiospores with subfree pillars. The Brazilian specimens agree with the holotype, although it comprises only one poorly conserved basidiome with only rust-brown (6E8) context remnants, from which it is impossible to elucidate structure or presence of resinous bands. Ryvarden (2000, 2004) described broadly ellipsoid basidiospores, but this shape agrees with neither his measurements (10–11 × 6–7 μm) nor the ellipsoid basidiospores of the type specimen (9–11 × 7–8 μm). *Ganoderma orbiforme* is morphologically similar to *G. multiplicatum,* but the latter has smaller basidiospores (8–9.9 × 6.2–6.8 μm) with free pillars and pileipellis cells with only short protuberances. Although recorded from the states of Amazonas and Paraná, Brazil by de Meijer in 2006 (Baltazar & Gibertoni 2009), Gomes-Silva et al. (2011), and Ryvarden & de Meijer (2002), *G. orbiforme* probably has a wider tropical distribution. We record this species from the states of Rio de Janeiro and São Paulo here for the first time.

Ganoderma parvulum Murrill, Bull. Torrey bot. Club. 29: 605 (1902). Figs 8, 22

= *Ganoderma stipitatum* (Murrill) Murrill, N. Amer. Fl. 9: 122 (1908).

Basidiomata 1.7–5.5 × 2.2–4 × 0.7–1.3 cm, annual, substipitate to sessile, with a contracted base, occasionally imbricate, woody. Pileus semicircular, round-flabelliform to flabelliform, convex to applanate; surface glabrous, rivulose to slightly radially rugose, hard, glossy to dull; with a laccate crust, not cracked, hard (difficult to penetrate with the fingernail), but easily lost and then leaving the surface relatively homogeneously dull, zonate; surface reddish-black to violet-brown (11F4) in 80–90% of the pileus, reddish-brown (9E8) towards the margin; margin pure white or yellowish, entire to slightly lobulate, thin, smooth. Substipe when present 0.9–1.5 × 1–1.5 cm, short and thick, thinner toward the base, horizontal, slightly darker than pileus, solid. Context 0.4–0.8 cm thick, fibrous, homogeneous, cream (4A3), azonate; with resinous dark bands up to half of the context. Pores 5–6 per mm, round, woody; pore surface yellowish-white (3A2) to light yellow (4A4) when fresh,

darkening to ochraceous or yellowish-brown (6E8) when aging and drying; tubes 0.2–0.4 cm long, unstratified, dark brown contrasting with the context. Hyphal system dimitic. Contextual trama: generative hyphae 2.4–5.6 µm diam., thin-walled, with conspicuous clamps, non-branched, hyaline to yellowish; skeletal hyphae 5.6–12 µm diam., thick-walled to generally solid, septate to non-septate, arboriform with few branches, moderately branched, golden-yellow. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 48–60 × 7.2–9.6 µm, cylindrical to narrowly clavate, entire or rarely with one lateral protuberance, thick-walled to solid, apex with granulations, golden-yellow, amyloid. Basidiospores 8–9 × 6–6.8 µm, Q = 1.18–1.38, broadly ellipsoid, apex truncate, with apical germ pore, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars up to 0.3 µm thick, free; endosporium wrinkled. Basidia not observed. Cystidia absent. Chlamydospores 9.6–10.5 µm, globose, thick-walled, with inter-walled very thick pillars, yellow.

Habitat: Frondose forest, mixed ombrophilous alluvial forest.

Material examined: **NICARAGUA**, without data, C.L. Smith s.n. (NY, lectotype of *G. parvulum*; BR, isolectotype); without data, C.L. Smith s.n. (NY, lectotype of *G. stipitatum*; BR, isolectotype). **BRAZIL**, **Paraná**, Curitiba, São José dos Pinhais, ADEA-reserve, Reserva Biológica Cambuí, on decayed tree, 7 July 1979 A.A.R. de Meijer 91 (EMBRAPA); 10 June 1987, A.A.R. de Meijer 850 (EMBRAPA); on dead dicotyledonous trunk, 14 December 1989, A.A.R. de Meijer 1418 (EMBRAPA).

Remarks: *Ganoderma parvulum* may be recognized by its generally small basidiomata, hard pileus crust, resinous dark bands contrasting with the pale context, cylindrical pileipellis cells with apical granulations, and small basidiospores with free pillars. The species is morphologically similar to *G. perzonatum* and *G. weberianum*, but *G. perzonatum* has larger basidiomata, a soft pilear laccate crust (easy to penetrate with the fingernail), a not fully homogeneous context, and pileipellis cells with concentric elongate granulations while *G. weberianum* has a not fully homogeneous context that changes to yellow when cut and basidiospores with subfree pillars. In his description of *G. parvulum*, Ryvarden (2000, 2004) reported "the lower part of context dark brown, darker than the intermediate and upper paler brown parts," which, in our terminology, is the equivalent to a not fully homogenous context. He also noted pileipellis cells without incrustations. He synonymized *G. parvulum* with *G. stipitatum*, recorded by him for Brazil (Ryvarden 2000). We agree with Ryvarden (2004) that they are synonyms, but the name *G. parvulum* has priority over *G. stipitatum*. Steyaert (1980) cited a wrong reference for the *G. parvulum* protologue ("North. Am. Fl. 9: 13, 1908"), and this was apparently followed by Ryvarden (2004). Ryvarden (2004) cited *G. stipitatum* from Bolivia, Brazil, Costa Rica, Nicaragua, Peru, Suriname, and Venezuela, but some of the cited specimens have a dark brown context and larger basidiospores and may

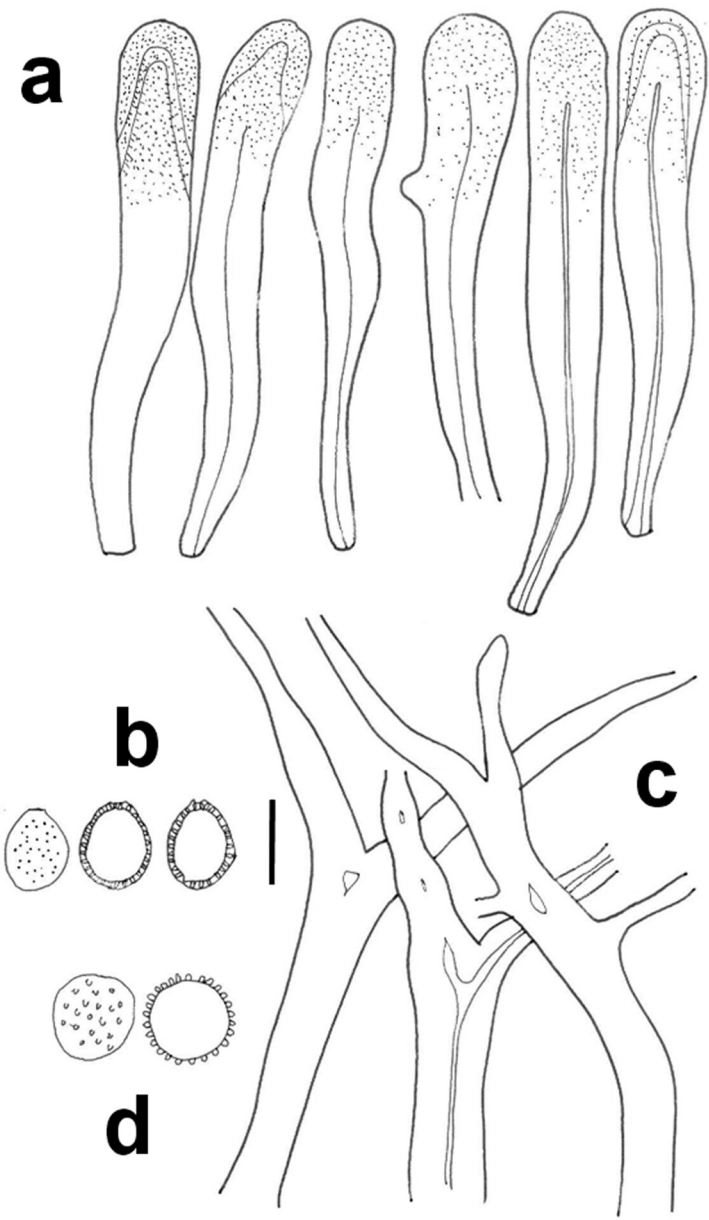

Fig. 22. *Ganoderma parvulum* (NY type). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores.
c. Crustohymeniderm: skeletal hyphae. **d**. Chlamydospores.

represent another species (unpublished observations by M.G. Torres-Torres). Gomes-Silva et al. (2011) and Welti & Courtecuisse (2010) cited this species (as *G. stipitatum*) from Brazil, Belize, and French Guiana. The specimens from USA (NY) noted by Welti & Courtecuisse (2010) and revised by Torres-Torres in 2008 correspond to *G. parvulum* [= *G. stipitatum*]. Rajchenberg & de Meijer (1990) cited *G. parvulum* from Paraná, Brazil (specimen de Meijer 850); but Ryvarden & de Meijer (2002) reported de Meijer 850 and 1418 as *G. resinaceum*. Our examinations show both collections to be very different from *G. resinaceum* and with the cream context and smaller basidiospores that corresponds to *G. parvulum*.

Ganoderma perturbatum (Lloyd) Torrend, Brotéria, sér. Bot. 18: 34 (1920). Figs 9, 23

Basidiomata 4 × 5 × 1.2 cm, perennial, stipitate, woody-corky, light in weight. Pileus reniform, convex; surface glabrous, bumpy, semiglossy to glossy, concentrically sulcate; with a laccate crust, not cracking, difficult to remove, easy to penetrate with the fingernail; surface almost homogeneous violet-brown (darker than 11F7 or 11F8); margin whitish to yellow, entire, obtuse, sulcate. Stipe 4.7 × 1 cm, lateral, cylindrical, solid, very dark violet-brown (11F8) to black, concolorous to generally darker than pileus; surface smooth to tuberculate, shiny, red-wine almost black, darker than pileus. Context 0.4 cm thick, fibrous, not fully homogenous, raw-sienna or light brown (6D7), to slightly darker next to the tubes, azonate; resinous incrustations not very visible. Pores 3–4 per mm, angular to round, woody; pore surface yellow (3A2); tubes up to 0.8 cm thick, stratified, concolorous with the lower part of the context. Hyphal system trimitic. Contextual trama: generative hyphae 3.2 µm diam., thin-walled, hyaline, scarce; skeletal hyphae 2.5–7.5 µm diam., generally solid to thick-walled, non-septate to septate in the apex near to the pileipellis, arboriform, golden-yellow; binding hyphae 1.9–2.2 µm diam., thick-walled, yellowish, scarce. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 43.5–83.8 × 6.2–14.9 µm, clavate to narrowly clavate, entire or rarely with one lateral protuberance or branch; thick-walled, multistratified, golden-brown, without granulations in the apex; slightly amyloid. Basidiospores (9.9–)10.8–12.4(–13) × 8–9.3(–9.9) µm, Q = 1.14–1.43, broadly ellipsoid to ellipsoid, few subglobose, apex subacute, with apical germ pore difficult to observe, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars 0.5–0.6 µm thick, partially anastomosed. Basidia not observed. Cystidia absent.

Habitat: Not specified.

Material examined: **BRAZIL**, **Rio Grande do Sul**, Lageado, without date, R. Rick s.n. (BPI, holotype); Santa Maria, Distrito de Boca do Monte, on dead buried wood, 22 April 1961, J.P. da Costa Neto s.n. (SP60278).

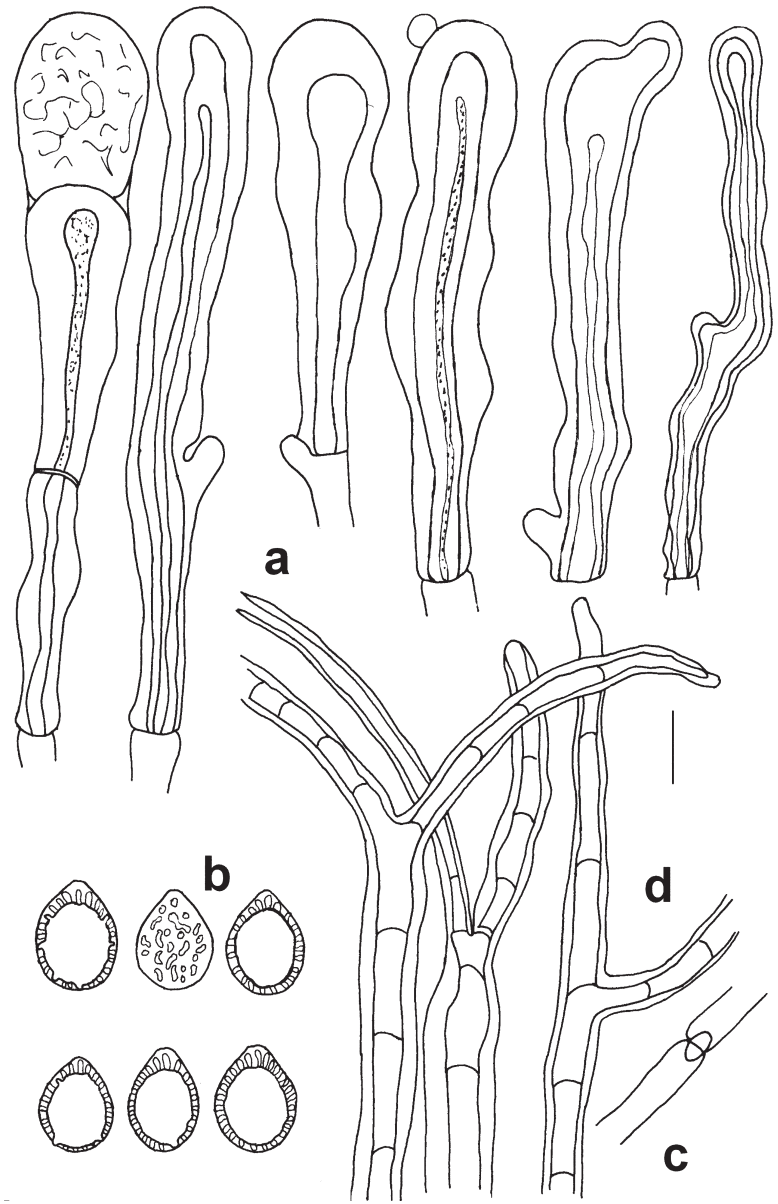

Fig. 23. *Ganoderma perturbatum* (SP60278). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores.
c–d. Hyphal system of crustohymenoderm: **c**. Generative hyphae. **d**. Skeletal hyphae.

Remarks: Distinctive features of *G. perturbatum* are the stipitate basidiome, a not fully homogeneous context, entire pileipellis cells with multi-stratified walls, and basidiospores with a subacute apex and partially anastomosed pillars. Steyaert (1967) synonymized it with *G. dorsale* and Ryvarden (1990) considered it in the *G. lucidum* complex. *Ganoderma dorsale* is similar, but differs by a duplex context and generally incrusted pileipellis cells. Although only a small fragment of the *G. lucidum* neotype remains [F. Fennici Exsiccati 239, Finland, Aboa (Turku), Runsala, n. hosp, P.A. Karsten 1858 (H, neotype)], it demonstrates a pale and homogeneous (maybe not fully homogeneous) context, and basidiospores with sub-free pillars that distinguish it from *G. perturbatum*. The specimen SP60278 was labeled as *G. lucidum* in SP. This is the second world record for *G. perturbatum*. Although known only from Brazil, this species likely has a wider tropical distribution.

Ganoderma perzonatum Murrill, N. Amer. Fl. 9: 121 (1908). Figs 10, 24

Basidiomata 3.5–10 × 3–12 × 0.6–1.8 cm, annual, substipitate, occasionally imbricate, woody-corky, light in weight. Pileus flabelliform to round-flabelliform, convex to applanate; surface glabrous, bumpy, glossy to semiglossy, concentrically sulcate; with a laccate crust, not cracking, difficult to remove, easy to penetrate with the fingernail; surface almost homogeneous violet-brown (11F8), to garnet-red (11E8) towards the margin; margin whitish to generally concolorous, entire, thin, smooth. Context 0.3–0.9 cm thick, 0.7 cm average, fibrous, not fully homogeneous, pale in general, pale-orange to light orange (5A3, 5A4) upwards, gradually changing to light brown (6D7) toward the tubes but in a narrow zone, zonate; with resinous bands. Pores 4–6 per mm, angular to round, woody; pore surface pale-yellow (2A3) to sun-yellow (2A5); tubes 0.5–0.7 cm thick, unstratified to stratified, concolorous with the lower part of the context. Hyphal system dimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 5–13 µm diam., generally solid to thick-walled, non-septate, arboriform, yellowish to golden-yellow. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 50–86 × 6.2–13.6 µm, cylindrical, apex obtuse to rarely subcapitate, entire or with one lateral protuberance; thick-walled, generally multi-stratified only in the apex, golden-yellow, with concentric elongate granulations in the apex; dextrinoid. Basidiospores 8.3–10.2 × 5.9–7.4 µm, Q = (1.25–)1.33–1.53, widely ellipsoid to ellipsoid, apex truncate, with apical germ pore, light yellowish-brown, inamyloid; perisporium wrinkled, hyaline; exosporium with inter-walled pillars up to 0.3 µm thick, free; endosporium wrinkled. Basidia 15.5–18.6 × 8–11 µm, utriform, hyaline. Cystidia absent.

Habitat: Mangrove, Amazonian forest.

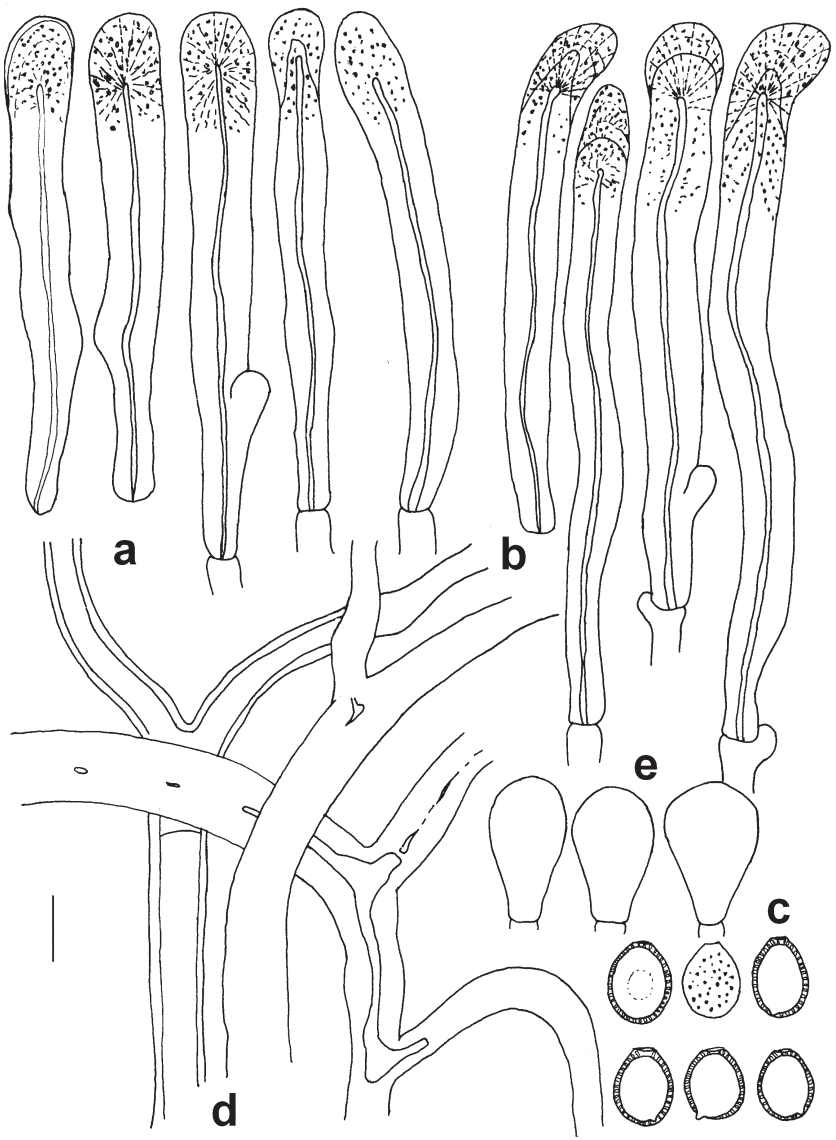

Fig. 24. *Ganoderma perzonatum* (a, c–e: SP50687, b: SP233313). Bar = 8 µm.
a–b. Pileipellis cells **c**. Basidiospores. **d**. Crustohymeniderm: skeletal hyphae. **e**. Basidiola.

Material examined: **CUBA**, **La Habana**, Santiago de Las Vegas, on mango log, F.S. Earle 309 (UPS, lectotype). **BRAZIL**, **Amapá**, Grande do Curua, Bailique, Igarapé, on dead wood, 22 September 1988, H. Sotão & coll. 88.18.13 (SP233313); mangrove, Ilha de Maracá, on dead wood, January 1989, H. Sotão & coll. 88.21.06 (SP233306); **Pará**, Santarém, 21 November 1965, B. Lowy 228B (SP92143); **Rio Grande do Sul**, Porto Alegre, Parque Farroupilha, on *Salix babylonica* trunk, 4 Jun 1960, J.C. Paim Costa s.n. (SP50687).

Remarks: *Ganoderma perzonatum* can be identified by its pale context, small basidiospores, and cylindrical pileipellis cells with apical elongate concentric granulations. The studied specimens agree with the lectotype, which, however, has inconspicuous resinous bands in the context. Ryvarden (2000) described "oblong ellipsoid" basidiospores but with the same dimensions as described here. This is the second world report for *G. perzonatum,* previously known only from Cuba. Although Mycobank (http://www.mycobank.org/) cites *G. perzonatum* as a synonym of *G. parvulum*, we regard them as independent (see Remarks under *G. parvulum*). For other related species see Torres-Torres et al. (2008). Three of the studied specimens were labeled as *G. lucidum* in SP.

Ganoderma pulverulentum Murrill, N. Amer. Fl. 9: 121 (1908). Figs 11, 25

Basidiomata 10 × 15 × 1.5 cm, annual, sessile, imbricate, woody-corky, light in weight. Pileus round-flabelliform, applanate; surface glabrous, bumpy, soft-corky, semiglossy, concentrically sulcate; with a laccate crust, not cracked, generally difficult to remove, easy to penetrate with the fingernail; surface very dark reddish-black, almost black close to the base of the pileus, to photo-brown (9F8), henna (7E8) to oxide-red (8E8) towards the margin; margin whitish, lobulate, thin, smooth. Context 0.7–0.9 cm, fibrous-corky, not fully homogenous, ochre-yellow (5B6) to dark brown (7F7) close to the tubes, zonate; with discontinuous resinous bands. Pores 4–5 per mm, angular to round, woody; pore surface cream to pale-yellowish (3A3), darkening when bruising or aging; tubes 0.7–1 cm thick, stratified, concolorous with the lower part of the context. Hyphal system trimitic. Contextual trama: generative hyphae 4–4.8 μm, thin-walled, with conspicuous clamps, hyaline; skeletal hyphae 2.8–12.8 μm diam., thick-walled to solid, non-septate, arboriform or not, very branched, yellowish to golden-yellow, predominant; binding hyphae 1.6–4 μm diam., subthick-walled to solid, non-septate, hyaline to yellowish, scarce. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 37.2–59 × 8–16 μm, narrowly clavate to clavate, generally entire; thick-walled, apex with scarce granulations, golden-yellow to yellowish-brown, amyloid. Basidiospores 9.6–12.8 × 6.2–8 μm, Q = 1.41–1.64, ellipsoid, apex truncate, with apical germ pore, yellowish-brown, inamyloid; perisporium semi-wrinkled, reddish-yellow; exosporium with inter-walled pillars 0.4–0.5 μm thick, partially anastomosed; endosporium smooth. Basidia not observed. Cystidia absent.

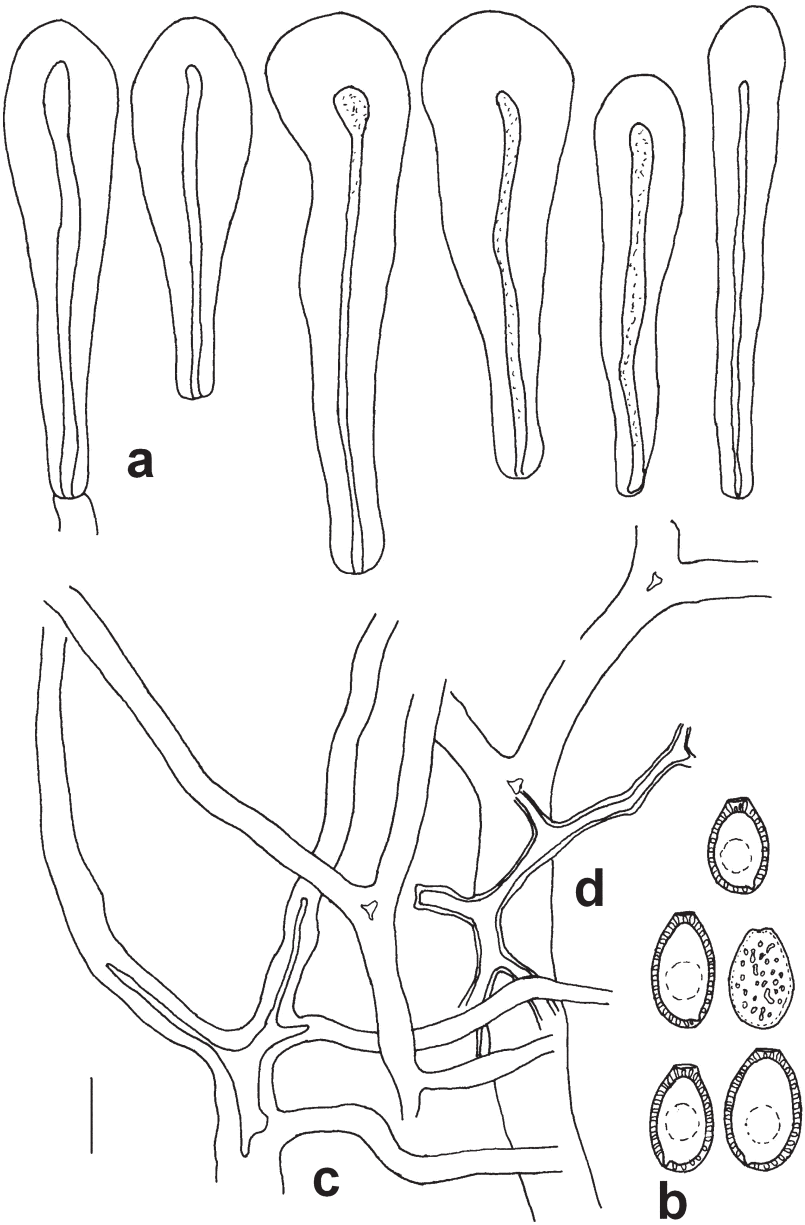

Fig. 25. *Ganoderma pulverulentum* (SP103257). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores.
c–**d**. Crustohymeniderm: **c**. Skeletal hyphae. **d**. Binding hyphae.

Habitat: Tropical secondary vegetation, near the city.

Material examined: **GRENADA**, on dry manchinell, W.E. Broadway s.n. (NY, lectotype). **BRAZIL**, **Bahia**, Correntina, on trunk, 28 January 1967, D.M. Vital s.n. (SP 103257).

Remarks: Distinctive features of *G. pulverulentum* are the lightweight basidiomata, entire pileipellis cells with granulations, and basidiospores with partially anastomosed pillars. The Brazilian specimen agrees with the lectotype, except that the latter has narrower pileipellis cells (8–11.2 μm diam.) with conspicuous granulations. This species is morphologically similar to *G. resinaceum* and *G. praelongum* Murrill, and Ryvarden (2004) synonymized it with *G. resinaceum*. However, both have a context without resinous deposits and basidiospores with free pillars. Furthermore, *G. resinaceum* has a homogenous light reddish-brown (7E7) context, while *G. praelongum* has a pale duplex context, ochre-yellow (6D7) above and rust-brown (6E8) close to the tubes (F.S. Earle & L. Murrill 536, lectotype, NY). *Ganoderma pulverulentum* was known only from the type locality, until recently recorded from French West Indies (Martinique) by Welti & Courtecuisse (2010). This is the first record of the species for Brazil. This fungus may have a wider neotropical distribution.

Ganoderma resinaceum Boud. ex Pat., Bull. Soc. mycol. Fr. 5: 72 (1889). Figs 12, 26
= *Ganoderma chaffangeonii* Pat., Bull. Soc. mycol. Fr. 5: 74 (1889).

Basidiomata 2.4–5 × 3–6.5 × 0.9–1.5 cm, annual, sessile, woody-spongy. Pileus round-flabelliform, convex to applanate; surface glabrous, uniform to slightly bumpy, slightly soft, glossy, broadly concentrically sulcate; with a laccate crust, cracked, easy to remove and to penetrate with the fingernail; surface violet-brown (darker than 11F7) to dark red in almost all the pileus, gradually changing to orange (5A7) toward the margin or fully violet-brown (11F7), darker in adult basidiomata; margin whitish, brownish-orange to concolorous, entire, thin to obtuse, smooth. Context 0.4–1.3 cm thick, fibrous-spongy, homogeneous, light reddish-brown (7E7), with an apricot (5B6) thin fringe below the laccate crust, azonate; without resinous bands. Pores 4–5 per mm, angular to circular, woody; pore surface paste yellow (2A4) to yellow (3A2) when fresh, darkening to ochraceous or yellowish-brown (6C5) when aging or drying; tubes 0.1–0.5 cm long, stratified, concolorous with the context. Hyphal system trimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 1.9–6.8 μm diam., thick-walled, generally thick-walled to solid, non-septate, arboriform or not, moderately branched, golden-brown; no binding hyphae were observed. Hymenophoral trama: generative hyphae 1.9–3.1 μm diam., thin-walled, hyaline, scarce; skeletal hyphae 2.8–7.5 μm diam., thick-walled to solid, non-septate, arboriform or not, moderately branched, golden-brown; binding hyphae 2.8–4.4 μm diam., generally thick-

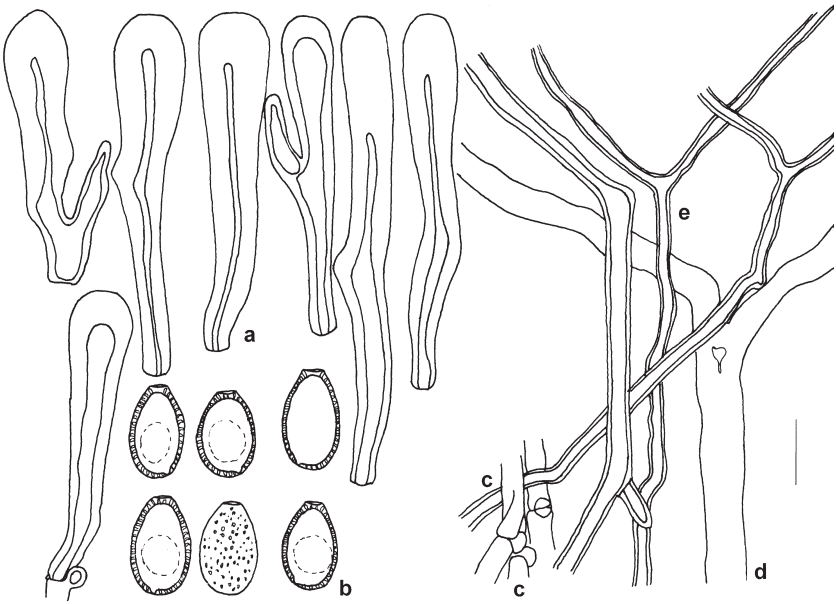

Fig. 26. *Ganoderma resinaceum* (SP61535). Bar = 8 μm.
a. Pileipellis cells. **b**. Basidiospores.
c–**e**. Crustohymeniderm: **c**. Generative hyphae. **d**. Skeletal hyphae. **e**. Binding hyphae.

walled to solid, non-septate, golden-yellow to yellowish-brown. Pileipellis a crustohymeniderm, cells 34–59 × 6.2–9.3 μm, clavate, narrowly clavate, or almost cylindrical, generally without protuberances or branches, few with one lateral branch, thick-walled to solid, apex with granulations, brownish-yellow, amyloid. Basidiospores 11.2–12.5 × 6.5–7.4 μm, Q = 1.5–1.72, ellipsoid to oblong, apex truncate, with apical germ pore, yellowish-brown, inamyloid; perisporium smooth, hyaline; exosporium with inter-walled pillars up to 0.4 μm thick, free; endosporium wrinkled, reddish-brown. Basidia not observed. Cystidia absent.

Habitat: Not specified.

Material examined: **FRANCE**, **Loir-et-Cher**, Blois, on *Quercus* trunks in mature forest, J.L. Boudier s.n. (PC, holotype). **VENEZUELA**, Orinoco region, on trunks of trees, 1885, J. Chaffangeon s.n. (PC, holotype of *G. chaffangeonii*; FH, isotype). **BRAZIL**, **Mato Grosso**, Rio Alto Juruena, August 1962, M. Mee s.n. (SP61535).

Remarks: This species presents a generally very dark pileus, homogenous brown context, smooth cylindrical pileipellis cells, and relatively large basidiospores with free pillars. Although *G. resinaceum* is a rare species, many authors have used this name for organisms with very different features. For

example, Ryvarden & de Meijer (2002) listed as *G. resinaceum* de Meijer 1418 (EMBRAPA), which properly represents *G. parvulum*, and de Meijer 2776 and 3238 (EMBRAPA), which correspond to a different, unidentified species. For this reason, based on the literature, its distribution is uncertain. Steyaert (1980) proposed synonymizing *G. chaffangeonii* with *G. resinaceum;* we examined type specimens of both taxa and agree with this opinion.

Ganoderma sessiliforme Murrill, Bull. New York Bot. Gard. 8: 149 (1912).

Figs 13, 27

Basidiomata 4–7 × 5.7–10 × 1.1–1.2 cm, annual, sessile to substipitate, occasionally imbricate, woody, but light in weight. Pileus flabelliform to semicircular, somewhat conchate to convex; surface glabrous, rugose to radially rugose, hard, semi-glossy, slightly concentrically sulcate; with a laccate crust, not cracking, easy to remove and to penetrate with the fingernail; surface darker than violet-brown (9F8) in the 80% of the pileus, wine-red (11D8) towards the margin; margin whitish to mandarin-orange (6B8), entire to slightly lobulate, acute to obtuse, smooth. Substipe 3 × 1–1.5 cm, horizontal, flattened, solid, surface shiny, red-wine to almost black, darker than the pileus. Context 0.5–0.7 cm, fibrous, homogeneous to not fully homogeneous, pale in general, orange-white (5A2), cocoa (6E6) toward the tubes, with a deep yellow (4A8) fringe below the laccate crust, azonate; without resinous bands. Pores 3–4 per mm, angular, woody; pore surface pale-yellow to pastel-yellow (3A3, 3A4), darkening to brown (6D8) when bruising or aging; tubes 0.4–0.6 cm thick, darker than context. Hyphal system dimitic. Contextual trama: no generative hyphae were observed; skeletal hyphae 2.5–11.2 μm diam., mainly solid to some thick-walled, septate to non-septate, arboriform, with few branches to branched, yellowish to golden-yellow, predominant. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 52.7–68.2 × 6.8–14.8 μm, narrowly clavate to clavate, generally smooth or with one lateral protuberance, thick-walled, golden-yellow, without granulations, slightly amyloid. Basidiospores (8.7–)9.9–10.3 × 6.3–8.8 μm, Q = 1.31–1.57, ellipsoid, apex truncate, with apical germ pore, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars 0.3–0.4 μm thick, subfree, in some free; endosporium wrinkled. Basidia not observed. Cystidia absent. Chlamydospores 11–16.7 × 7.4–13 μm, Q = 1.35–1.6(–2), ellipsoid, with one or both apexes mucronate, thick-walled, yellowish.

Habitat: Not specified.

Material examined: **MEXICO**, **Morelos**, Municipality of Cuernavaca, on dead wood, 24–27 December 1909, W.A. & E.L. Murrill 392 (NY, holotype). **BRAZIL**, **Rio Grande do Sul**, Porto Alegre, Parque Saint Hillaire, on wood, 30 April 1960, M.H. Homrich s.n. (SP61432).

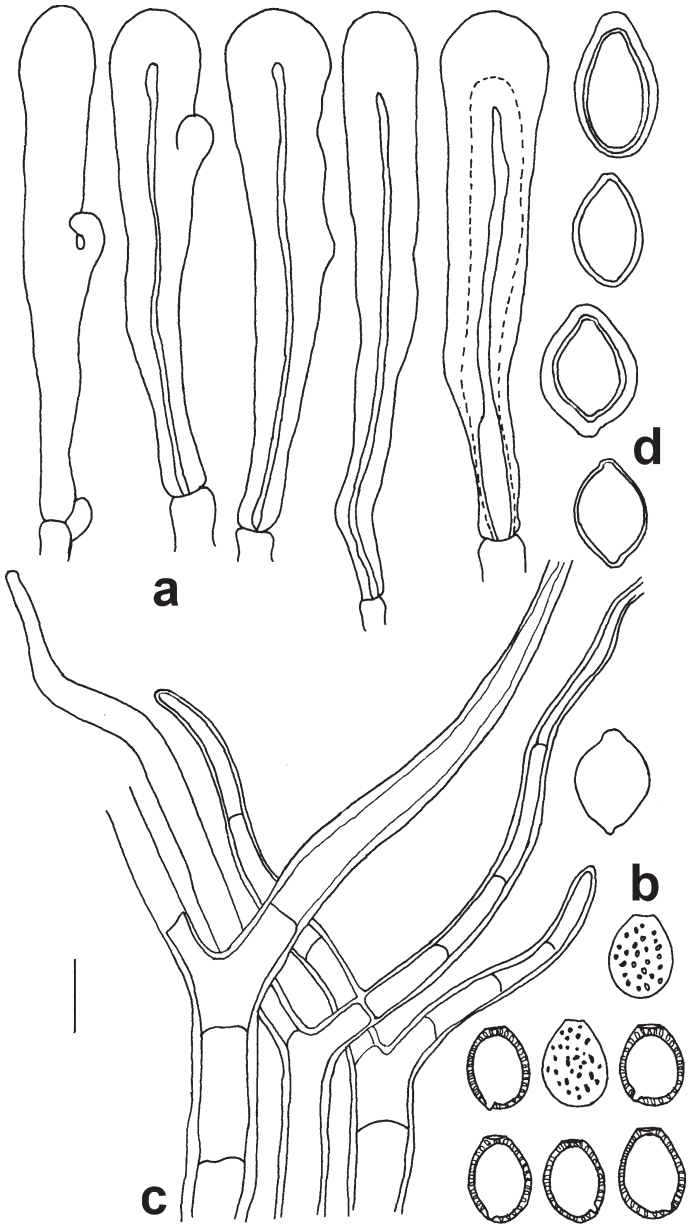

Fig. 27. *Ganoderma sessiliforme* (SP61432). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores. **c**. Crustohymeniderm: skeletal hyphae. **d**. Chlamydospores.

Remarks: This species has generally a conchate basidiome, pale context without resinous deposits, and relatively small basidiospores. Ryvarden (2004) did not include *G. sessiliforme* in his treatment of neotropical polypores. This is the second record of the species for Brazil, where it was previously recorded by Gottlieb & Wright (1999a). It is a rare fungus, known only from Argentina, Brazil, and Mexico.

Ganoderma subfornicatum Murrill, N. Amer. Fl. 9: 121 (1908). Figs 14, 28

Basidiomata 3.4–10.5 × 4–8 × 1.3–1.8 cm, perennial, substipitate, rarely with a long stipe, with a contracted base, woody. Pileus round-flabelliform, generally applanate; surface glabrous, bumpy, slightly to radially rugose, very shiny, remarkably concentrically sulcate; with a laccate crust, difficult to remove, hard but easily to penetrate with the fingernail; surface totally reddish-brown (darker than 9F8) almost black, homogenous; margin concolorous with the pileus, entire, thick, obtuse to truncate, sulcate. Substipe 1.4–2(–5.3) × 1.2–2.3 cm, generally short and thick, cylindrical, horizontal or lateral, concolorous with the pileus, solid. Context 0.4–0.8 cm thick, fibrous, not fully homogeneous, pale in general, yellowish-orange (4B7) upwards, gradually changing to rust-brown (6E8) next to the tubes; with resinous bands. Pores 4–6 per mm, round, woody, very small; pore surface brown (6D8); tubes 0.6–1 cm long, stratified, concolorous with the base of the context. Hyphal system trimitic. Contextual trama: generative hyphae 2.4–4.3 µm diam., thin-walled, with large and conspicuous clamps, hyaline to yellowish; skeletal hyphae 5.6–11.2 µm diam., generally solid, not-branched or with few branches, golden-yellow to yellowish-brown, predominant; binding hyphae 1.2–3.7 µm diam., solid, non-septate, hyaline to yellowish, scarce, notably thinner and paler than skeletal hyphae. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 37.2–62 × 5–9.3 µm, cylindrical to irregular, not clavate, commonly with a constriction near to the apex, generally with one to two branches (occasionally three) and up to five protuberances, mainly solid to thick-walled, not multi-stratified-wall, apex with ferruginous granulations, yellowish, slightly amyloid. Basidiospores 9.6–11.8 × 6.4–8 µm, Q = 1.41–1.69, ellipsoid to oblong, apex truncate, slightly visible apical germ pore, yellowish, inamyloid; perisporium semi-wrinkled, reddish-brown; exosporium with inter-walled pillars up to 0.4 µm thick, free; endosporium semi-wrinkled. Basidia not observed. Cystidia absent.

Habitat: Seasonal forest, Amazonian ombrophilous rain forest, Atlantic rain forest.

Material examined: **BELIZE**, s.loc., on dead wood, 1906, M.E. Peck s.n. (NY, lectotype). **BRAZIL**, **Paraná**, Paranaguá, Pontal do Sul, on wood, 23 October 1968, G. Hatschbach 20106 (SP8633); Antonina, Parque Marumbí, Rio do Nunes, on dead dicotyledonous trunk, 12 December 1987, A.A.R. de Meijer 962 (EMBRAPA); **Pernambuco**, Recife,

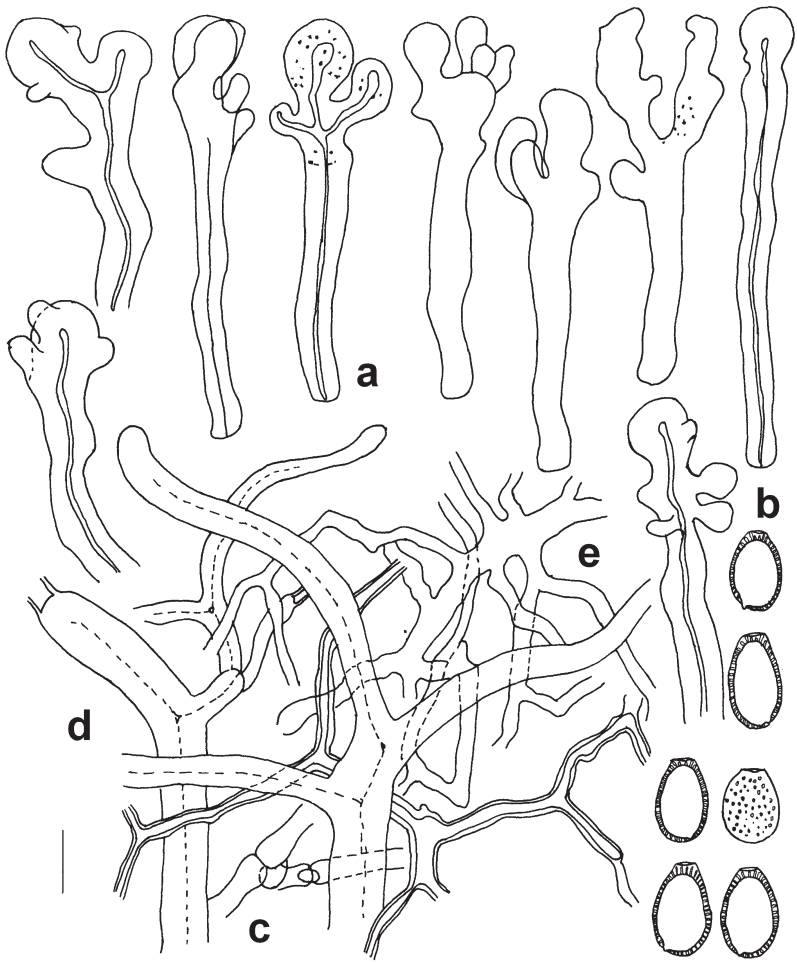

Fig. 28. *Ganoderma subfornicatum* (SP375899). Bar = 8 μm.
a. Pileipellis cells. **b**. Basidiospores.
c–**e**. Crustohymeniderm: **c**. Generative hyphae. **d**. Skeletal hyphae. **e**. Binding hyphae.

Dois Irmãos, 1 May 1956, s.coll. (SP39359); **Rondônia**, Rio Ji-Paraná, Acampamento JP-15, on wood, 8 December 1987, M. Capelari 1770 (SP214815); **São Paulo**, Cananéia, Ilha Comprida, 2 km from the beach, on wood, 25 February 1983, O. Yano & J.R. Pirani 5977 (SP214844); **Sergipe**, SE Estação Ecológica Santa Isabel, 11 November 2003, U. da Silva-Aragão s.n. (SP375899).

Remarks: This species has a shiny and dark pileus that contrasts with a generally pale context with resinous bands. Micromorphologically, it is distinguished by its pileipellis cells with many protuberances. Ryvarden (2004) did not include

G. subfornicatum in his treatment of neotropical polypores. According to Moncalvo & Ryvarden (1997), *G. subfornicatum* has been reported throughout the tropics. Rajchenberg & de Meijer (1990) cited this species from Brazil (specimens de Meijer 962 and 1234); however, later Ryvarden & de Meijer (2002) mentioned that those specimens corresponded to *G. orbiforme*. We studied them and conclude that de Meijer 1234 is *G. orbiforme* while de Meijer 962 comprises two basidiomata, one representing *G. subfornicatum* and the other (marked as de Meijer 962A) *G. applanatum* (see above).

Ganoderma vivianimercedianum M.G. Torres, Mycotaxon 105: 448 (2008).

For a complete description see Torres-Torres et al. (2008).

Habitat: Secondary tropical forest.

Material examined: **MEXICO**, **Estado de México**, Valle del Tepeite, 10 km NE of Santa María, 10 August 1986, E. Bastidas-Varela s.n. (ENCB, holotype). **BRAZIL**, **Rio Grande do Sul**, Guaiba, Fazenda da Faculdade de Agronomia e Veterinária, em lenho morto, 29 March 1963, J.P. de Costa-Neto s.n. (SP70533); **São Paulo**, Tremembé da Cantareira, Villa Amalia, Horto Forestal SPSF, podridao da madeira, 20 May 1952, C.D.F. Pacheco s.n. (SP109563); **Amapá**, Ilha de Maracá, tronco de madeira en descomposição, 24 October 1988, H. Sotao et al. 88.21.26 (SP233297).

Remarks: *Ganoderma vivianimercedianum* is recognized by the flabelliform basidiomata with a contracted base, not fully homogenous light brown context, narrowly clavate to clavate pileipellis cells, entire or with up to two lateral protuberances, unbranched or rarely so, with scattered granulations in the apex, and 8.8–11.2(–12) × 6.4–8 μm basidiospores (Torres-Torres et al. 2008). This species is morphologically close to *G. argillaceum* Murrill, *G. perzonatum*, and *G. resinaceum*. *Ganoderma argillaceum* has larger basidiospores (10.4–13.6 × 7.2–9.6 μm) and pileipellis cells without granulations; *G. perzonatum* has slightly smaller basidiospores (8.4–10.4 × 6.4–7.2 μm) and remarkable large cylindrica pileipellis cells with concentric elongate granulations only in the apex; *G. resinaceum* has 11.2–13.6 × 6.5–7.4(–8.1) μm basidiospores, narrowly clavate to almost cylindrical pileipellis cells, and a fibrous-spongy homogeneous light reddish-brown context without resinous bands.

Ganoderma weberianum (Bres. & Henn. ex Sacc.) Steyaert, Persoonia 7: 79 (1972).

Figs 15, 29

Basidiomata 4–5.5 × 4–5 × 0.9–1.3 cm, annual, substipitate, with a contracted base, occasionally imbricate, woody. Pileus semicircular, round-flabelliform to flabelliform, convex to applanate; surface glabrous, rivulose to slightly radially rugose, hard, glossy to dull; with a laccate crust, not cracking, difficult to penetrate with the fingernail, easily lost leaving the surface relatively homogeneously dull, zonate; surface reddish-black to violet-brown (11F7) or darker in almost all the pileus, except towards the margin where gradually

changes to orange (5A7) or fully violet-brown (11F7); margin pure white or yellowish, entire to slightly lobulate, thin, smooth. Substipe when present 0.9–1.5 × 1–1.5 cm, short and thick, thinner toward the base, horizontal, slightly darker than pileus, solid. Context 0.6–1 cm thick, fibrous, not fully homogeneous, light-yellow (4A4), darkening to reddish-brown (8F7) close to the tubes, changing to yellow when cut, zonate; with resinous incrustations throughout the context. Pores 4–5 per mm, angular to round, woody; pore surface yellowish-white (3A2) to sun-yellow (2A5) when fresh, darkening to ochraceous or yellowish-brown (6E8) when aging and drying; tubes 0.2–0.4 cm long, unstratified, concolorous with lower part of the context. Hyphal system dimitic. Contextual trama: generative hyphae 1.9–3.7 μm diam., thin-walled, with conspicuous clamps, non-branched, hyaline to yellowish; skeletal hyphae 1.6–8 μm diam., thick-walled to generally solid, septate to non septate, non-branched to arboriform with few branches, moderately branched, apex rounded and slightly wider near to the pileipellis, golden-yellow. Hymenophoral trama as the contextual trama. Pileipellis a crustohymeniderm, cells 46.6–65.7 × 6.2–10.6 μm, cylindrical to narrowly clavate, entire, thick-walled to solid, apex with granulations, golden-yellow, slightly amyloid (light bluish). Basidiospores 8.4–9.3 × 6.8–7.2 μm, Q = 1.29–1.5, ellipsoid, few broadly ellipsoid, apex truncate, with apical germ pore, yellowish-brown, inamyloid; perisporium wrinkled, reddish-brown; exosporium with inter-walled pillars up to 0.5 μm thick, subfree; endosporium wrinkled. Basidia 13.6–17.3 × 8–9.3 μm, widely clavate, hyaline. Cystidia absent. Chlamydospores 9.3–10.5 μm, globose, thick-walled, with inter-walled, very thick pillars, yellow.

Habitat: "Cerrado".

Material examined: **BRAZIL**, **São Paulo**, S. Paulo Brotas, km 216–217 of São Paulo-Brotas Road, Região de Cerrado, 11 January 1962, A. Milanez & D. Altimari s.n. (SP61099).

Remarks: The most important features of *G. weberianum* are a hard pileus crust, pale context that changes to yellow when cut with resinous incrustations, cylindrical pileipellis cells with granulations, and small basidiospores. The single Brazilian specimen studied agrees with the specimen recorded from China by Wang et al. (2005), except that they describe clavate pileipellis cells which nonetheless appear cylindrical in their illustration. The examined specimen matches Steyaert (1972) and Corner's (1983) descriptions except for their observations of the inter-pillars in the basidiospores as barely visible ("minutely echinulate to apparently smooth;" Corner 1983). Our examination of the basidiospore ornamentation with a higher magnification lens (1600×) enabled us to detect how the pillars ("echinula" sensu Corner and Steyaert) relate to one another, appearing in this case as free pillars mixed with some fused ones. Steyaert (1972) described two forms of *G. weberianum*: one with long narrow

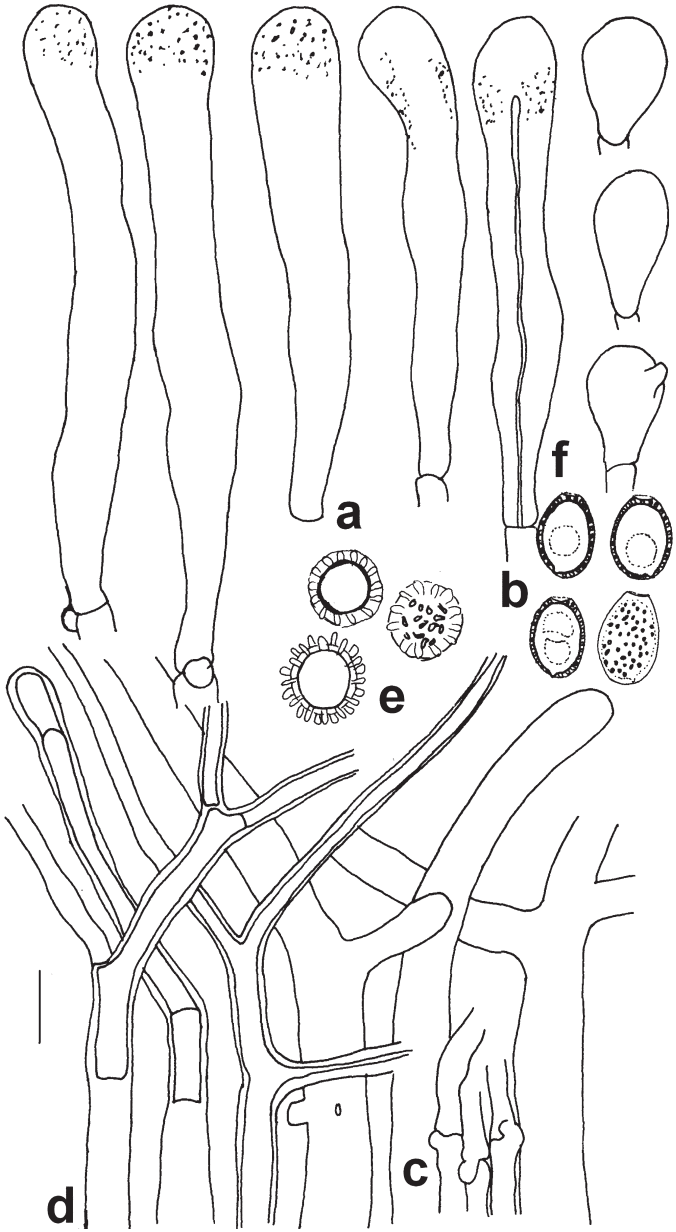

Fig. 29. *Ganoderma weberianum* (SP61099). Bar = 8 µm.
a. Pileipellis cells. **b**. Basidiospores. **c–d**. Crustohymeniderm:
c. Generative hyphae. **d**. Skeletal hyphae. **e**. Chlamydospores. **f**. Basidium and basidiola.

pileipellis cells (30 × 7–8 μm) and without or with few chlamydospores, and the other with short broad pileipellis cells (20 × 10–12 μm) and with abundant chlamydospores. Nevertheless, Steyaert's pictures show pileipellis cells that are longer than he described. On the other hand, Corner (1983) described long narrow pileipellis cells and abundant chlamydospores.

Ganoderma weberianum has been reported from Africa, Asia and Samoa Island (Steyaert 1972), Australia (Smith & Sivasithamparam 2000), China (Wang et al. 2005), and Singapore (Corner 1983), but Núñez & Ryvarden (2000) did not include it in their treatment of East Asian *Ganodermataceae*. This is the first record of *G. weberianum* in America.

Discussion

Although *G. annulare* (Lloyd) Boedijn, *G. bibadiostriatum* Steyaert, *G. citriporum* Ryvarden & Iturr., *G. chalceum* (Cooke) Steyaert, *G. colossus* (Fr.) C.F. Baker, *G. curtisii* (Berk.) Murrill, *G. lobatoideum* Steyaert, *G. lobatum* (Schwein.) G.F. Atk., *G. lucidum* (Curtis) P. Karst., *G. multicornum* Ryvarden, *G. multiplicatum* var. *vitalii* Steyaert, *G. nitens* (Fr.) Pat., *G. nitidum* Murrill, *G. oerstedii* (Fr.) Murrill, *G. pygmoideum* Steyaert, "*G. reniformis*" [*Elfvingia reniformis* (Morgan) Murrill], *G. subamboinense* (Henn.) Bazzalo & J.E. Wright ex Moncalvo & Ryvarden, *G. testaceum* (Lév.) Pat., *G. tropicum* (Jungh.) Bres., and *G. zonatum* Murrill have been cited from Brazil in the literature (e.g., Drechsler-Santos et al. 2008; Gerber & Loguercio-Leite 1997; Gomes-Silva et al. 2011; Gottlieb & Wright 1999a; Loguercio-Leite et al. 2005; Patouillard 1889; Steyaert 1962, 1980; Westphalen et al. 2010), they are not included in either key or descriptions because we were unable to examine any material representing them.

As a specimen of *G. sessile* Murrill was found in SP, the species is included in the key but not described; it lacked data and thus we are uncertain whether it was collected in Brazil. Gottlieb & Wright (1999a) tentatively determined BAFC 34352 from Brazil as *G. sessile*.

We exclude *G. neurosporum* J.S. Furtado [≡ *Haddowia neurospora* (J.S. Furtado) Teixeira] because basidiospores of the type specimen [Panama, Buenos Aires, on decaying root, 8 August 1945, S.L. Mayer s.n. (BPI, lectotype)] have crested ornamentations and do not correspond with *Ganoderma*.

Likewise, the type specimen of *G. opacum* (Berk. & Mont.) Pat. [Brazil, Bahía, B & M 32 (K, lectotype)] has *Humphreya*-like basidiospores. According to phylogenetic analysis with morphological and molecular data, the monophyletic *Humphreya* differs from *Ganoderma* (Torres-Torres et al. unpublished). Of the 30 specimens kept at EMBRAPA and SP labeled as *G. lucidum*, none of them belong to this species. Furthermore, it is probable that many Brazilian records under *G. lucidum* in the literature represent a minimum of nine different species, but this should be carefully verified.

Acknowledgements

The authors are grateful to Lorelei Norvell and Shaun Pennycook for their valuable comments and corrections, especially Dr. Pennycook for his nomenclatural guidance. Tatiana B. Gibertoni and Mario Rajchenberg are thanked for the critical review of this paper. We would like to express our gratitude to curators from BPI, EMBRAPA, ENCB, FH, INB, NY, O, PC, SP, and UPS herbaria, and to R.R.A. de Meijer for provide us his personal collection. Adriano Spielmann is thanked for taking the pictures of Brazilian specimens (SP) and Miguel de Santiago for inking the drawings. The senior author thanks to Red Latinoamericana de Botánica for the internship scholarship (RLB-05-P5) at Instituto de Botânica da Secretaria de Estado do Meio Ambiente, São Paulo. She also thanks Universidad Tecnológica del Chocó for grants for Mexico's internships. Funds were obtained from CONACYT (project CONACYT-SEP-2003-C02-42957) and Universidad de Guadalajara (projects 62935, 72640, 88682). Roberto Quintero and Alfonso Langle are thanked for the manuscript's English improvement.

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